Science and Technology for
Women

(Compendium of Technologies)

Compiled by:

Centre of Science for Villages
Wardha

Sponsored by:

Department of Science and Technology
New Delhi

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Science and Technology for Women

A Compendium of Technologies

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FOREWORD

Over the last decade, a special effort has been made by the Department of Science & Technology to demonstrate the application of science and technology in improving the life and status of women through the scheme 'Science and Technology for Women'. Projects undertaken by S&T institutions, voluntary organisations and universities have focussed on the innovation and development of new technologies and transfer of available technologies. An important activity under this programme has been the publication of Compendiums of Technologies prepared by the Centre of Science for Villages, Wardha. Organisations working for women's development have found these compendiums extremely useful and have demostrated several technologies in their projects.

This is the third compendium in the series and it is hoped that, based on the descriptions given, several new and inovative projects would be formulated with a view to improving the existing technologies, developing new ones and training women in their use. We hope that some of these projects would result in models for replication in various parts of the country, to demonstrate the important role which science and technology can play in development.

Joseph P. John
Head
Science & Society Division
Department of Science and Technology
New Delhi

INTRODUCTION

The Department of Science & Technology has been implementing the scheme 'Science & Technology for Women' since 1980. During the last one decade it has published two compendiums of technologies available for the benefit or rural women under the following titles:

1. Employment Generating Technologies;
2. Drudgery Reducing Technologies;
3. Drinking Water and Sanitary Technologies;
4. Nutrition & Health Improvement Technologies; and
5. Hazards & Accidents Protection Technologies

The first compendium was brought out in 1981 under the title "Science and Technology for Women"- a Compendium of Technologies - I; giving 150 techniques and addresses of institutions working in the field of women development in India. The second compendium was published in 1984 and it gave 75 techniques with illustrations under the same five sub-heads. This is the third compendium giving 101 techniques under the first three sub-heads. I hope that continuous updating will be done and more and more techniques added. All the three volumes have been compiled and produced by the Centre of Science for Villages (CSV), a voluntary institution doing pioneering work in the propagation of science and technology for a sustainable, socially just and ecologically sound order. The team consisting of Ms. Vibha Gupta, CSV, Wardha and Shri Rajiv Gupta, New Delhi have worked to identify the right kind of techniques and put them in proper form. These techniques have been proven in the field and in each case the name of the organisation which has evolved it has been given so that those who need to know more about the technique can approach the agency.

It has been found that in the the application of the techniques given in the earlier compendium, the voluntary agencies have themselves improved them and made the devices easy to operate. Many of these techniques have been taken up by voluntary agencies for training their workers and they would be useful for various development programmes for women. In such cases where a technological institution evolves a technique and the voluntary agency undertakes to carry it to the field and shows its applicability in a limited region, it is the work of the State to multiply it by incorporating the same in the national policy and programmes.

The "Science and Society Programme" of DST under which the programme "Science and Technology for Women" finds a place, is based on the principle that science and technology can be a definite tool for social change. We are struggling to prove this through these techniques which in the past have proven to be catalytic agents on a large scale. May this process of change accelerate and multiply to enable us, as Gandhi said, "Wipe the tears from the eyes of the last and the lowest".

Devendra Kumar
Chairman
Centre of Science for Villages
Wardha

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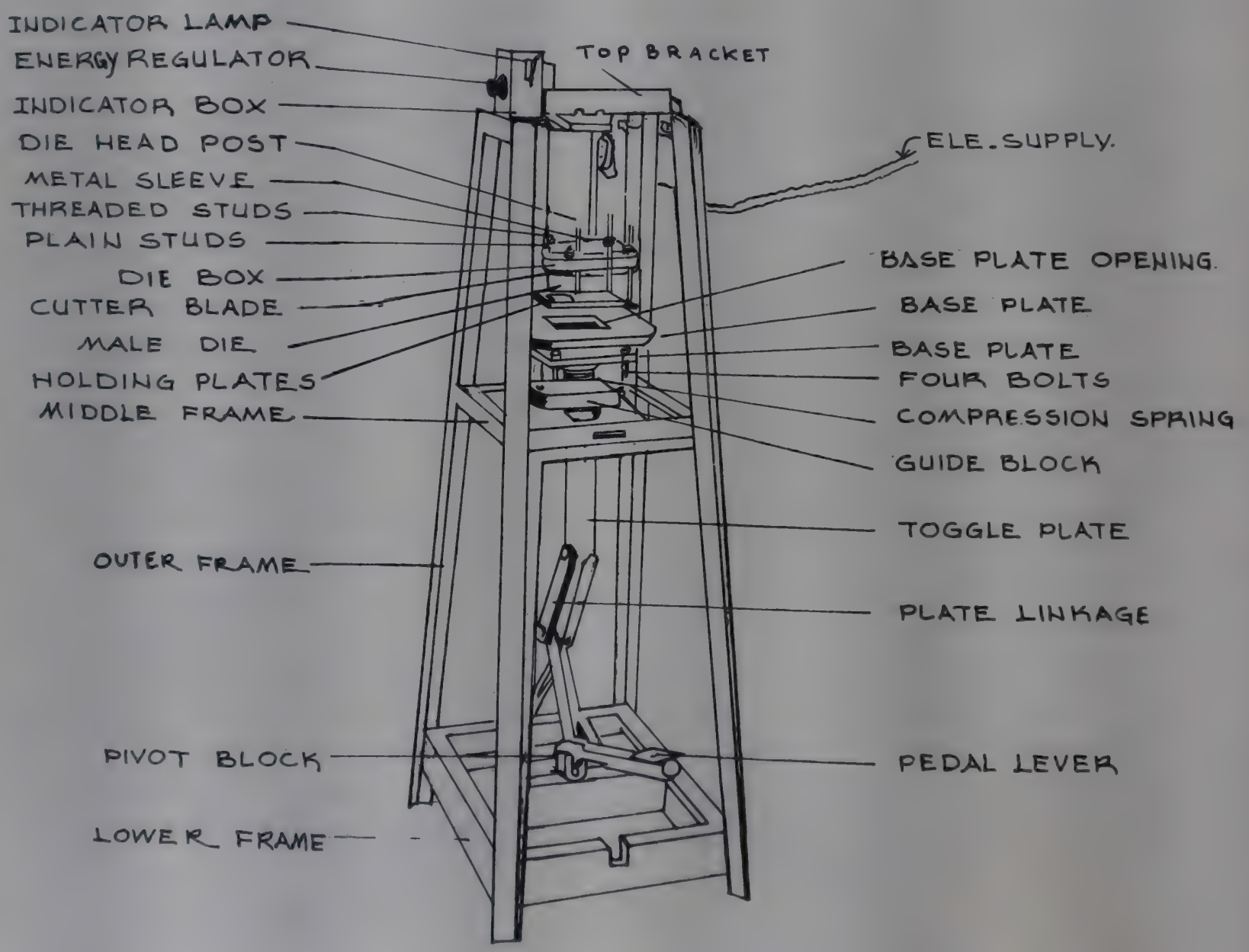
I.

EMPLOYMENT GENERATING TECHNOLOGIES

- Agro Based
- Food Processing
- Manufacturing
- House Construction

LEAF CUP MAKING MACHINE



TECHNOLOGY NO. 1

LEAF CUP MAKING MACHINE

DESCRIPTION : This machine helps to prepare stronger, elegant and uniform cups and plates of different sizes from leaves and paper at a rate much faster than the conventional method of leaf-cup making. In case of flimsy leaves, another layer of leaf, paper or polythene may be used for reinforcement. the method is simple. No adhesives are needed.

MATERIALS : Paper, Dried Banana leaves, Dried Bauhinia Vahili leaves (Hindi: *Kachnar*), Areca leaf sheath, Dried Butea Frondoza leaves (Hindi: *Palash*).

CONSTRUCTION : The machine consists of the following main parts: The body frame, upper die assembly, lower die assembly and base plate activator.

WORKING : The dry leaves are washed and softened by soaking in water for 10 to 30 minutes (the length of time depends on the type of leaves & their dryness) and again dried until they become pliable. The correct point of dryness is reached when the leaf does not crack when folded to 180 degrees, across the grain. All parts of the leaf, more than 3 mm thick are cut off. The energy regulator is set to maintain the male die temperature at about 150°C.

The leaf of adequate size is symmetrically placed on the base plate above the die-opening and the foot pedal is pressed down. As it lowers, the holding plates keep the leaf in position.

The pedal is lowered further holding the leaf/leaves in this position for a short period (5-10 seconds for a thin leaf and 20-30 seconds for materials like areca sheath), not only dries and sets the leaf in the shape of the die but also destroys the surface micro-organisms, thus making it hygienic.

By pressing the pedal with a jerk, the cutter incorporated in the machine trims the edges of the leaves.

When the pressure on the pedal is withdrawn, the leaf cup is ready and could be lifted out by hand.

Instead of one leaf, a combination of leaves and paper (or a polythene sheet) can be fed into the machine without any change in the procedure.

When using thicker and stiffer materials like areca sheath, the pressure on the holding plates may have to be increased by placing weight-blocks, above the stopper bushes of the plate studs. An operator using this machine can therefore produce 250 to 300 cups/dishes per hour from thin leaves or their combinations and about 100 cups/dishes from thicker meterial. A team of one skilled and one unskilled worker can earn about Rs. 20 per day.

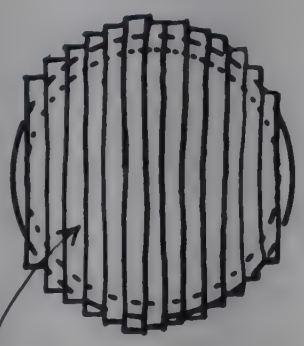
COST : Rs. 4000/- (approx.)

SOURCE : 1. DIRECTOR
CENTRAL FOOD & TECHNOLOGICAL
RESEARCH INSTITUTE
MYSORE - 570 013
KARNATAKA

2. ANIL & CO.
69 NGO'S COLONY
RAJENDRA NAGAR
MYSORE - 570 007
KARNATAKA

GREEK BASKET HIVE

WOODEN BAR



1

BEE PROOF COVER

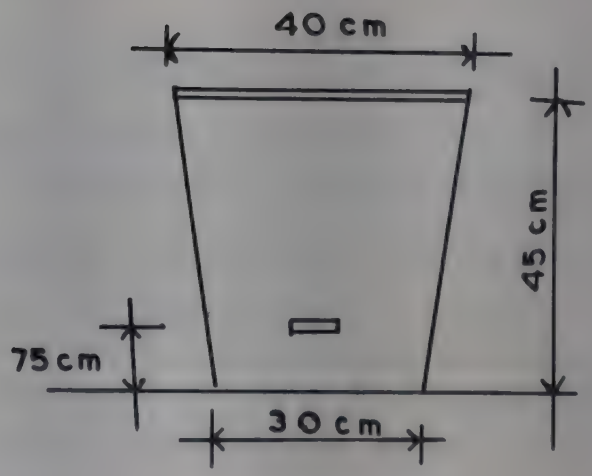
CONICAL THATCH HAT

HIVE ENTRANCE

3

2

COWDUNG & CLAY PLASTERING



4

TECHNOLOGY NO 2

GREEK BASKET HIVE

DESCRIPTION : Greek Basket Hive is an age old technology about which Aristotle has written — in 350 B.C. This technology is still pretty appropriate as it involves local material and local skill for its fabrication.

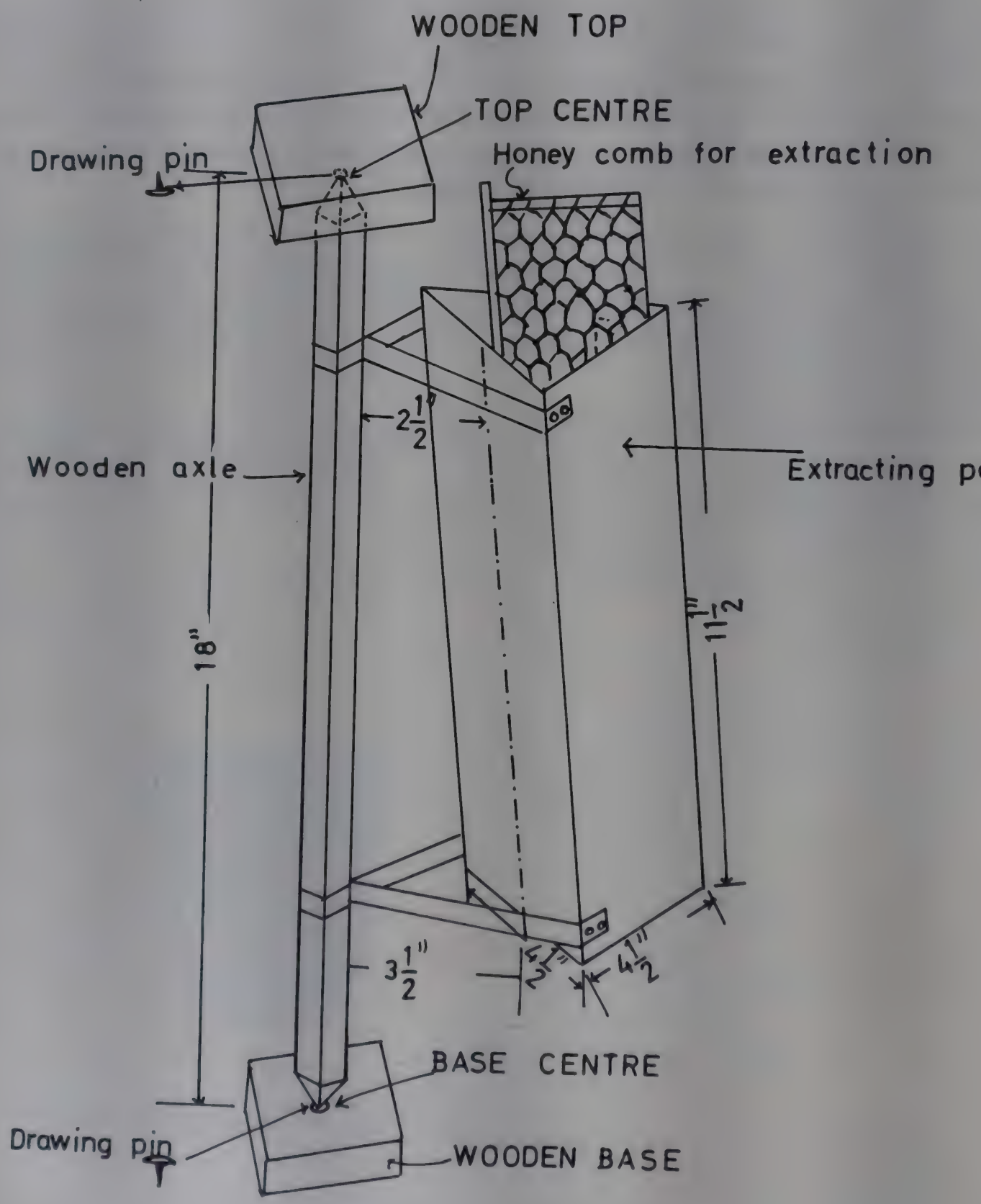
CONSTRUCTION : The basket has a wide top and a narrow base. The top is covered with parallel wooden bars 1.25 inches wide, placed close together in such a manner so as to form a bee-proof cover. Each bar is convex lengthwise (on the underside), with a clearance of about one inch. The convexing must come in the middle of the bar. Both ends should be left flat for about 2-3 inches to prevent the bees from passing through the ends where bars, which are larger than the circumference of the basket, rest on the rim of the the basket. (see figure 1).

Along the length, in the middle of every bar, a fine piece of comb is fixed underneath, with melted bee wax to guide the bees to build straight combs. The basket is plastered inside and out with a mixture of two parts of fresh cowdung to one part of clay. (figure 2). When the plaster is dry, the bars are placed on top of the basket which is then covered with a conical hat made of thatch to protect from sun and rain. (see figure 3).

It is vital to have the hive entrance at least three inches from the bottom so that if a comb does fall, the entrance will not be blocked. (See figure 4). When the honey is ripe and the honey-flow is over, the combs are cut from the bars. However, a fine strip of comb, no more than quarter inch, is left on each bar to guide the bees to build straight, new combs again.

SOURCE : CENTRE OF SCIENCE FOR VILLAGES
MAGAN SANGRAHALAYA
WARDHA - 442 001
MAHARASHTRA

SIMPLE HONEY EXTRACTOR



TECHNOLOGY NO 3

SIMPLE HONEY EXTRACTOR

DESCRIPTION : This appropriate honey extractor not ony avoids indiscriminate loss of bee-wealth as compared to the traditional technology wherein young bees and pollen are crushed en-masse to death and the honey-comb destroyed, but it also costs one-eighth of the market price of prevalent honey extractors.

MATERIALS : Wooden box, triangular pot of sheet-metal, wooden block, metal plate and an iron strip (for attaching the extraction pot to the axle).

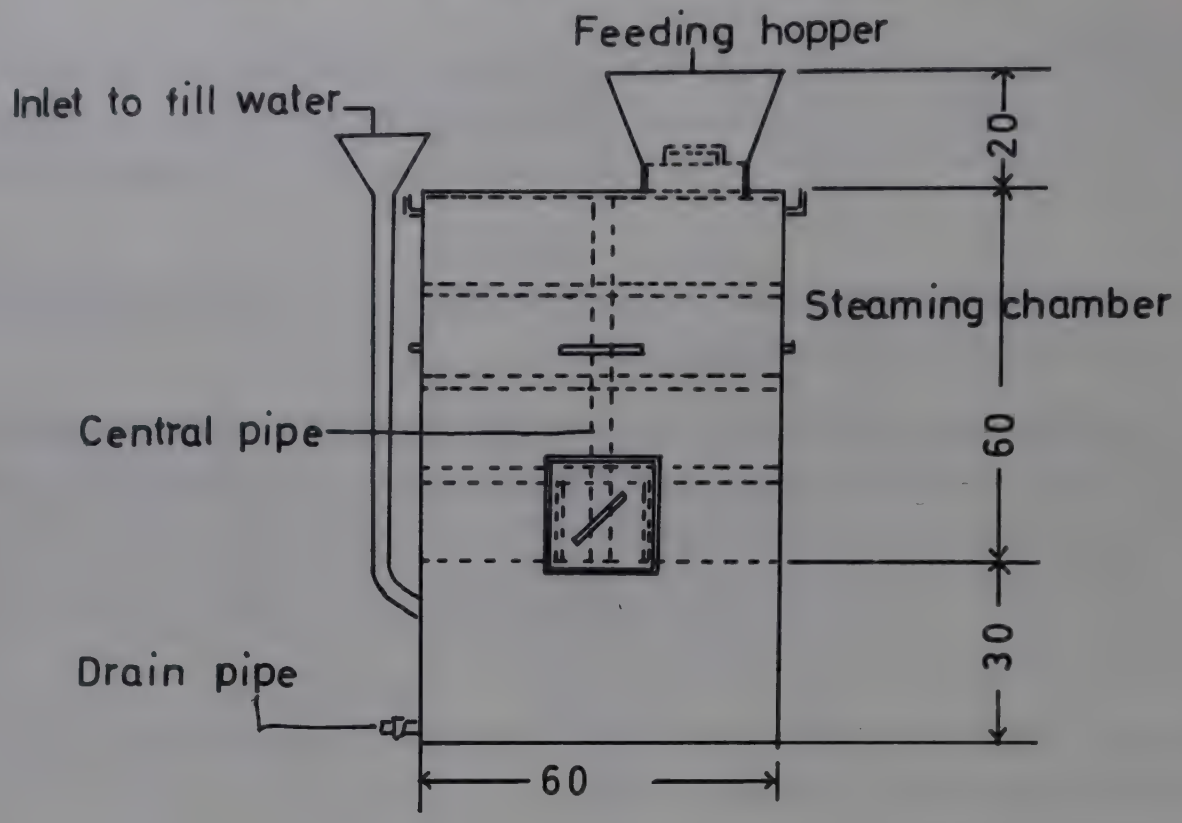
WORKING : The honey extractor comprises a traingular pot attached to the wooden axle. To begin with, unseal the thin wax coat on the honey cells with the help of a hot knife and place the honey comb in the extraction pot. Now, rotate the extraction pot clockwise smoothly with your hands. The pot revolves swiftly since it is attached to the wooden axle, whose pointed top and bottom ends pivot on wooden blocks. This propulsion generates the centrifugal force which throws the honey out of the comb and into the extraction pot.

Now, transfer the comb to the other side which is yet to be extracted, and repeat the process. The entire extraction process takes only 2-3 minutes.

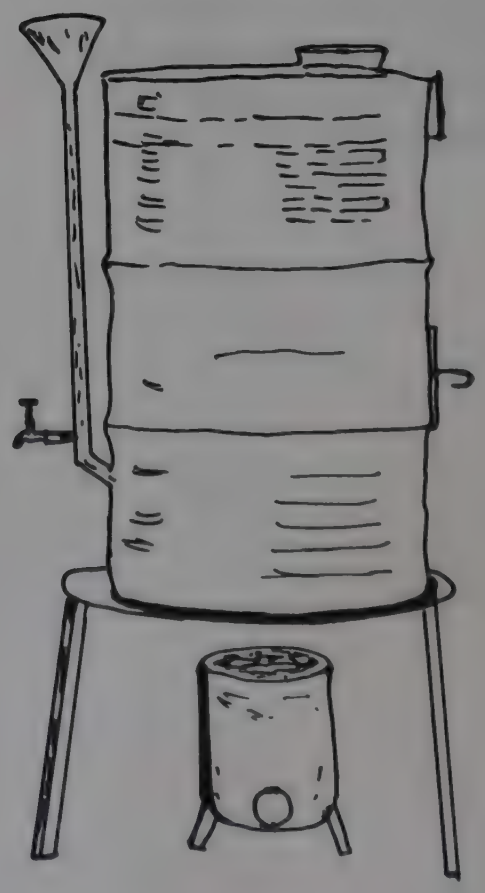
COST : Rs. 25/- (approx.)

SOURCE : SHRI AMRATRAO GHADGE
IN-CHARGE ROCK BEE PROJECT
CENTRE OF SCIENCE FOR VILLAGES
WARDHA - 442 001
MAHARASHTRA

MINI PARBOILING UNIT



MINI PARBOILING UNIT



All dimensions in mm

TECHNOLOGY NO. 4

MINI PARBOILING UNIT

DESCRIPTION : Parboiling of rice, whether it be domestic or for farm puposes, can be carried out efficiently by utilizing this Mini Parboiling Unit.

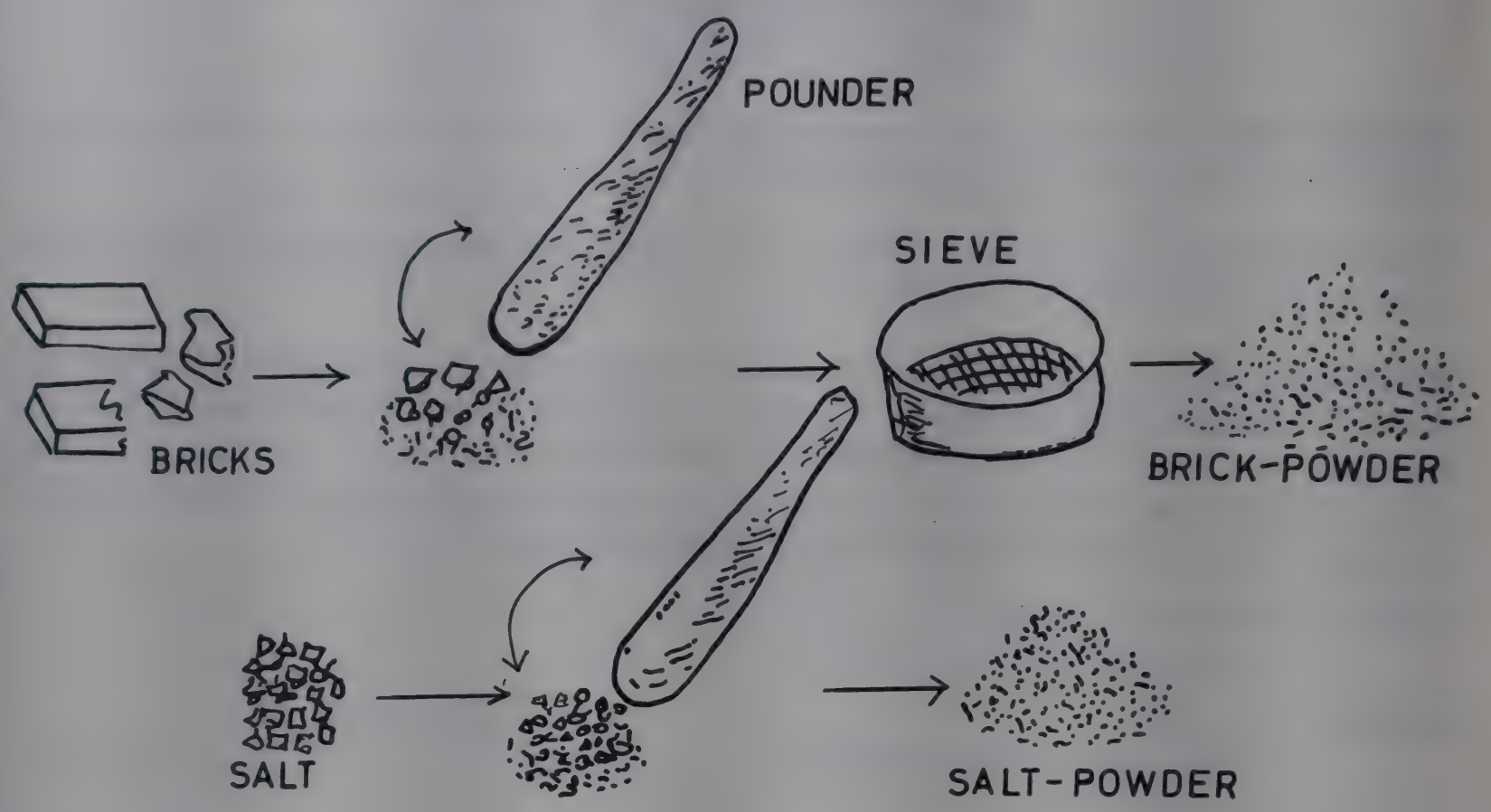
CONSTRUCTION : This unit has a feeding hopper, a steam chamber, a central pipe, a funnel which is used to fill up water and a drain pipe.

WORKING : The rice to be parboiled is soaked as well as steamed in the same unit without any further handling. For optimum results, rice shold be soaked for three-and-a half hours in 75 degrees centigrade hot water. The rice is steamed and dried subsequently in the sun. This technology provides 2 percent more head rice than achieved in the traditinal manner. This unit takes up a batch of 75 kg of paddy at one time with an output of 150 kg. of parboiler rice a day.

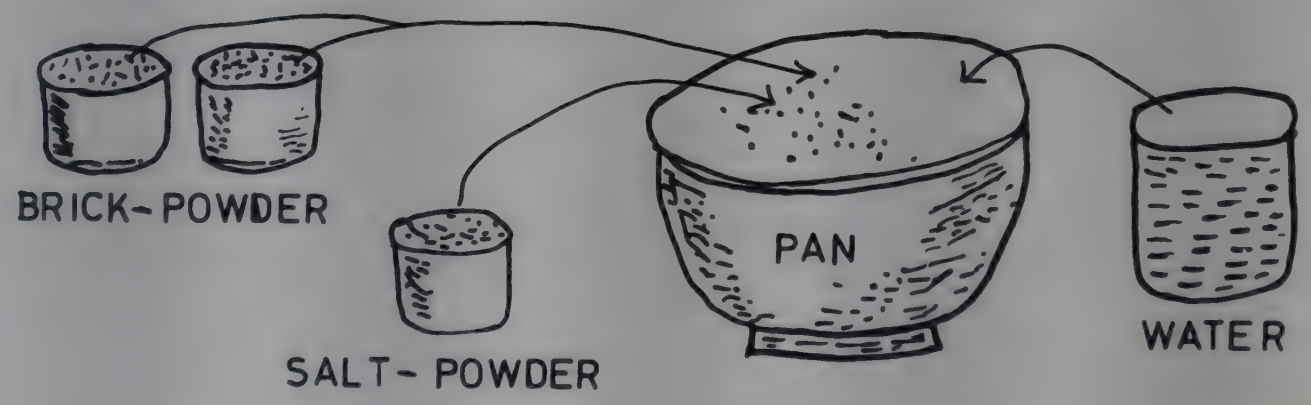
COST : Initial cost: Rs.400/-
Unit operational cost: Rs. 70/-

SOURCE : DIRECTOR,
CENTRAL RICE RESEARCH INSTITUTE
CUTTACK - 753 006
ORISSA

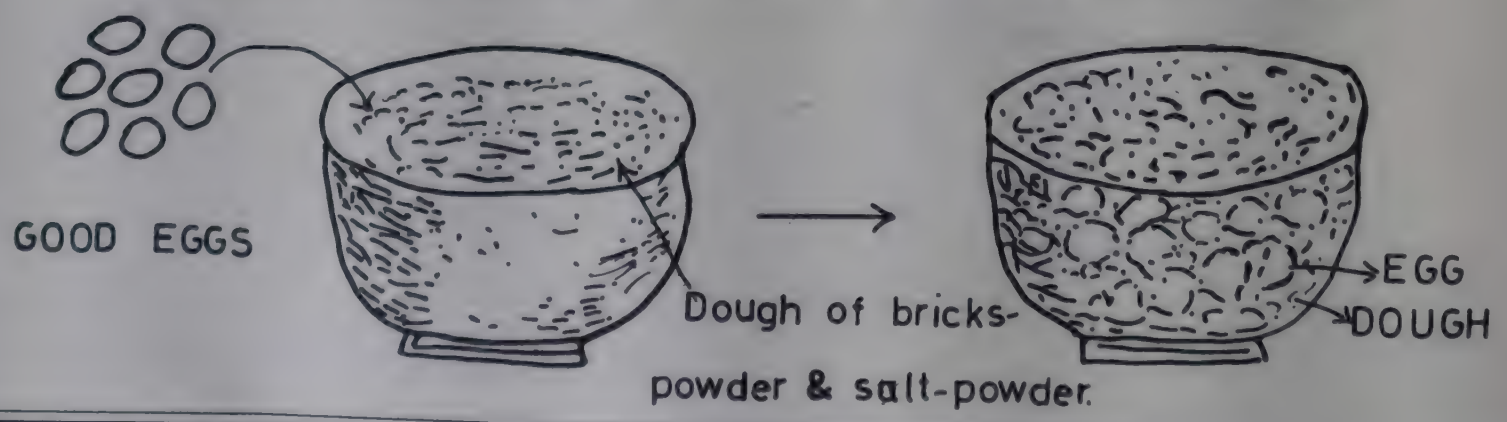
EGG PRESERVATION TECHNOLOGY



Powdering of Bricks and Common salt.



Mixing of salt & Brick powder with water in the pan.



TECHNOLOGY NO. 5

EGG PRESERVATION TECHNOLOGY

DESCRIPTION : This simple technology of preserving ~~the~~ eggs by salting is an economical one and materials required are cheap and readily available.

MATERIALS : Bricks, hammer, sieve, common salt, pan and water.

WORKING : Powder the bricks by hand-pounding and sieve them. Powder the common salt in a similar manner and mix the brick powder and common salt in a ratio of 2:1 respectively, by volume. Then add water to this mixture and knead it like a dough.

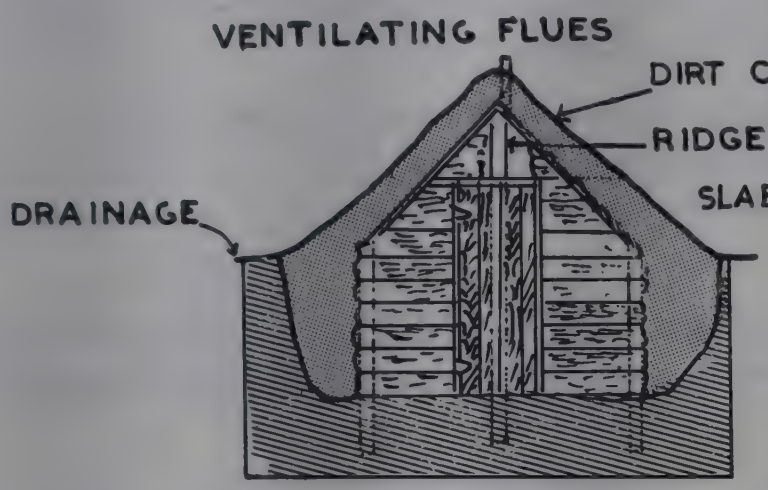
The second stage comprises of testing whether the egg is fit enough for preservation or is already fertilized. The test is simple as all you have to do is put it in a bowl full of water. If the egg floats it is unfit and if it sinks then it is still good. Now, keep these selected eggs in a pan and cover them with the brick-salt dough.

Keep this pan in shade for ten days, maintaining the wetness of the dough by frequent sprinklings of water. In the meanwhile, salt penetrates into the eggs and preserves them. Wash the eggs after 10 days and store them.

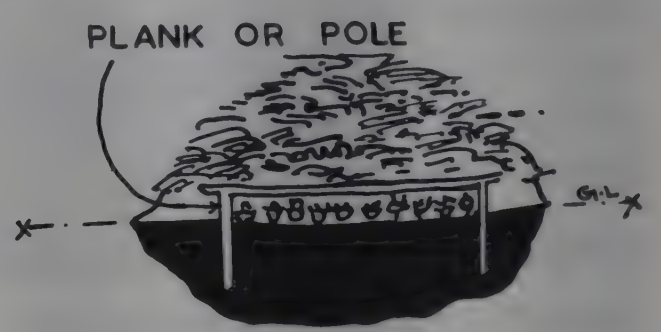
ADVANTAGE : The salted eggs taste good and can be stored to one and a half months.

SOURCE : CENTRAL FOOD TECHNOLOGY
RESEARCH INSTITUTE
MYSORE
KARNATAKA

CABBAGE STORAGE PITS

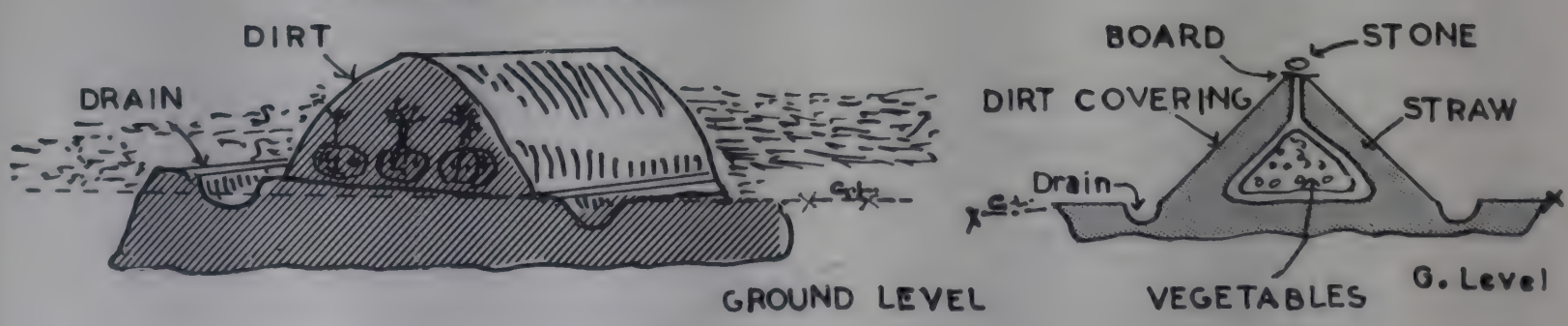


POST PLANK CELLAR
(FIG. 1)



CABBAGE PIT
(FIG. 2)

CONICAL OUTDOOR PIT



(FIG. 3)

TECHNOLOGY NO. 6

CABBAGE STORAGE PITS

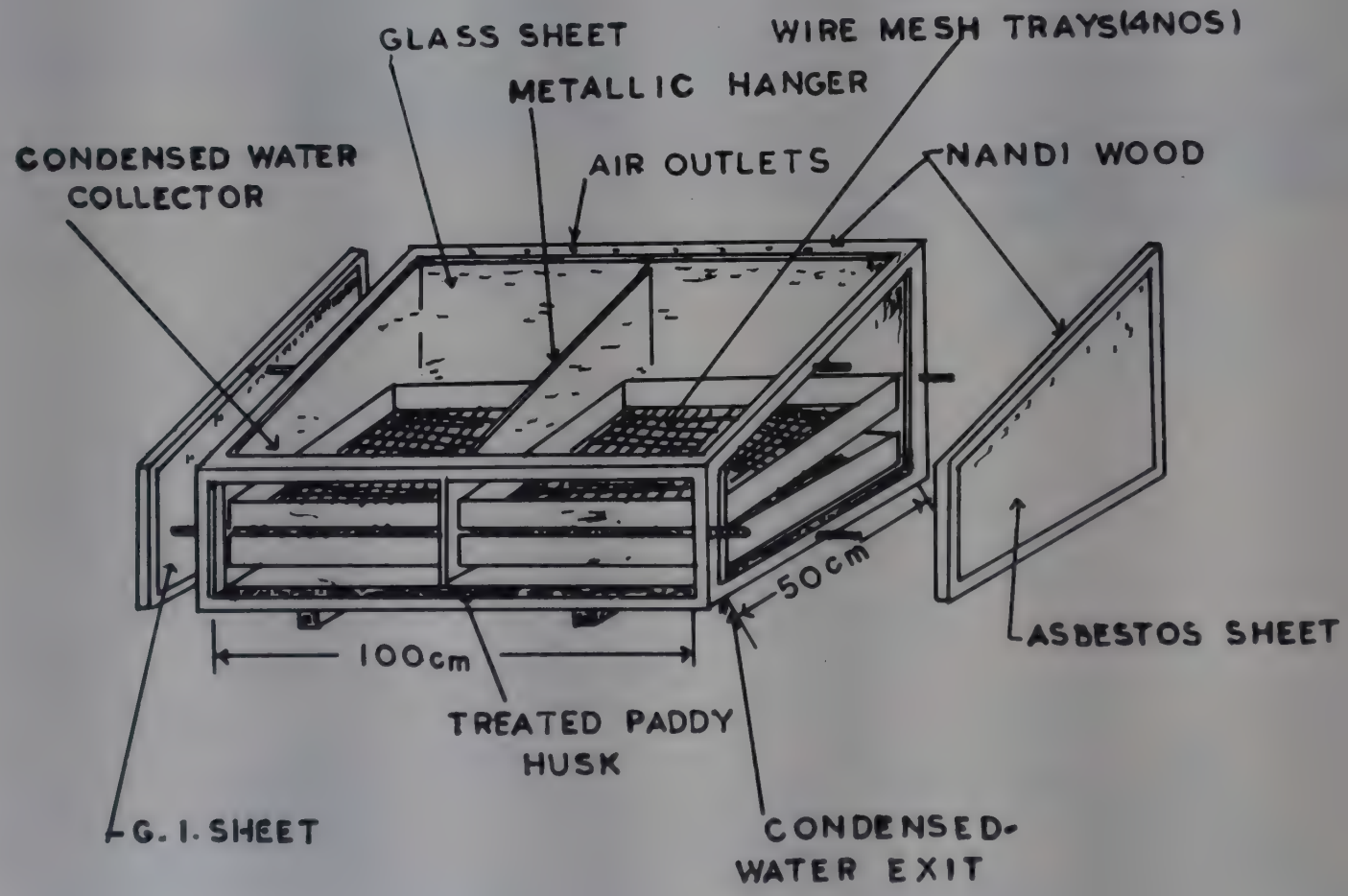
DESCRIPTION : Vegetables like cabbage, cauliflower ad other greens can be stored in pits, trenches, out-door cellars or caves to keep them fresh. Post Plank Cellars (like the one in figure 1) are low-cost but the wood will decay unless it is made water-proof. Cabbage pits, made of stakes and poles covered with straw (see figure 2) are pretty reliable. Cabbages can also be stored above the ground in cone-shaped pits in an area protected by drains from excess moisture (figure 3).

CABBAGE PITS : Dig a trench long enough to hold the number of cabbages to be stored. Pull the plants by the roots and set them side by side in the trench. Pack soil around the roots. Build a frame about 2 inches high around the bed, with poles or stakes driven into the ground. Bank the soil around the frame and place poles across the top to hold the covering of straw, hay or leaves.

CONICAL OUTDOOR PITS : Build the pit either on the surface of the ground, or in a hole 8 to 10 inches dep in a well-drained location. Spread a layer of straw or leaves on the ground. Stack the food to be stored on the litter in a cone-shaped pile. Cover the food with more straw and cover the entire pile with 3 to 4 inches of soil. Then, firm the soil with the back of a shovel to make it waterproof. Dig a shallow drainage ditch around the pit to carry away water. (see figure 3).

SOURCE : VOLUNTEERS IN TECHNICAL ASSISTANCE (VITA)
3706 RHODE ISLAND AVENUE
MT. RAINIER
MARYLAND, 20822
USA.

SOLAR DRIER (CABINET TYPE)



TECHNOLOGY NO. 7

CABINET TYPE SOLAR DRIER

DESCRIPTION : Rural women residing in coastal areas have to spend considerable amount of manual labour and time in sun-drying and processing marine products. similar are the probems faced by women in terms of farm products. This economical solar drier is a boon in this regard as it not only saves time but also reduces the human drudgery involved in the conventional process.

CONSTRUCTION : Cabinet Type Solar Drier consists of a rectangular box which is 100cm long, 50 cm broad and 35cm high, with a tilted upper lid. The drier, weighing around 50 kg, has a floor area of 5000 sq. cms. It has two special features — first, a nylon wick to collect and discharge condensed water; second, a detachable metallic hanger, fitted in the middle of the cabinet, to increase the drier-efficiency by about 10 per cent.

WORKING : To operate it, the drier is kept in an open space with its longitudinal axis in the east-west direction, the tilted cover facing the south. The material to be dried is closely spread over the 4 trays provided for the purpose. The side doors are then closed. Once every morning, the drier is opened; the material remixed; and the position of the trays interchanged.

ADVANTAGES : 1. It takes just 2 days instead of the 9 days (of conventional open-airdrying) to dry coconuts by this technology.

2. Red chillies and grapes could be dried in just three days.

COST : Rs. 650/- (approx.)

SOURCE : THE DIRECTOR
NATIONAL INSTITUTE OF OCEANOGRAPHY
GOA

BAMBOO SOLAR DRIER

Fig.1. Pieces of bamboo

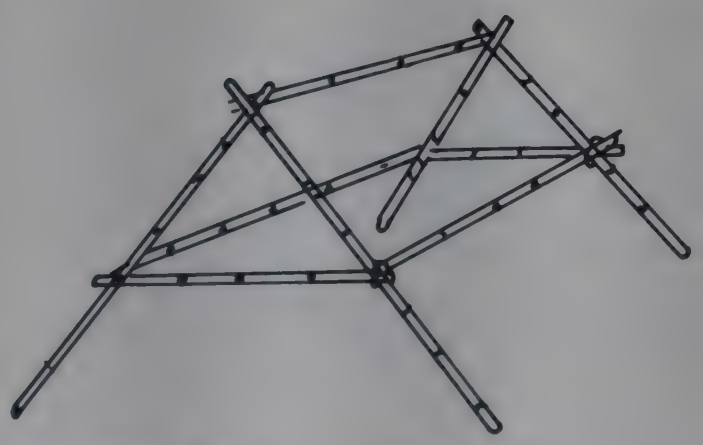


Fig. 2. Frame of bamboo.

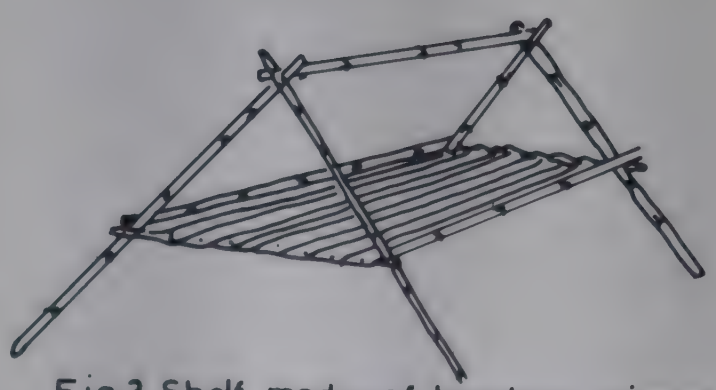


Fig.3. Shelf made of bamboo pieces.

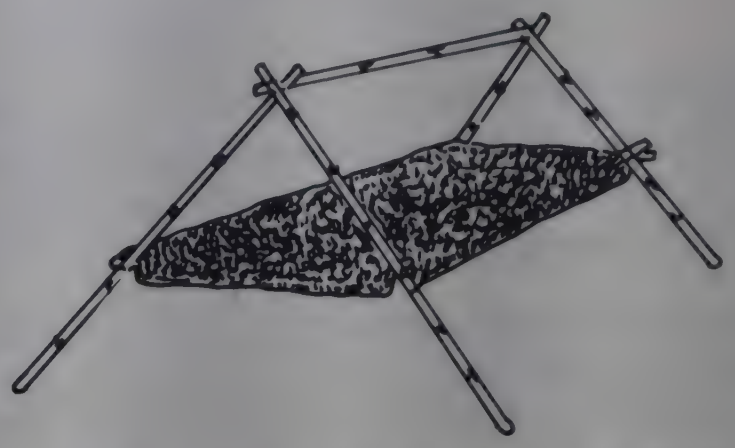


Fig. 4. Polythene sheet on Shelf.

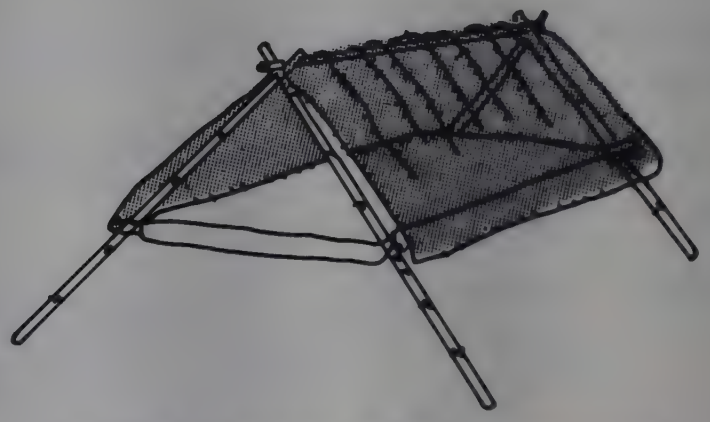


Fig. 5. Solar drier completed.

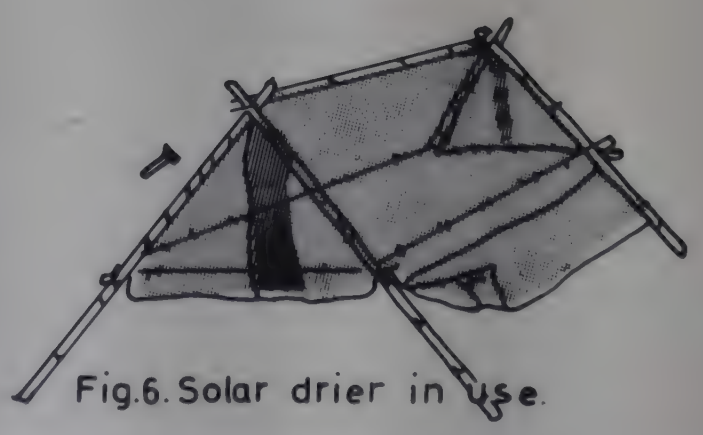


Fig.6. Solar drier in use.

TECHNOLOGY NO. 8

BAMBOO SOLAR DRIER

DESCRIPTION : Sun-drying is a time-tested post-harvesting technology, which is optimally utilized in the Bamboo Solar Drier which solves the problems of humidity and insects and could be easily constructed with locally available materials and skill.

MATERIALS : Bamboo, rope, 2 metres and 3 metres long black polythene, 3 metres wide and 6 metres long clear polythene and some big stones.

CONSTRUCTION : Cut 7 pieces of bamboo of the same length (2.5) metres). Cut 2 pieces of bamboo of same length (1.5 metres). Cut a groove 10 cm from each end. (See Figure 1). Each groove must be big enough to hold another piece of bamboo. Tie the pieces together to make a frame. (see figure 2). Cut 10 pieces of split bamboo of the same length (2.5 metres). Lay them flat to make a shelf (as shown in the figure 3). Nail them down at each end. Then, cut 2 metres of black polythene and spread it over the shelf. (see figure 4). Cut 6 metres of clear polythene and put it over the top and down the sides of the frame. fold the polythene ends. (See Figure 5).

Pull the polythene acorss the ends of the frame, as shown in the illustrations, and nail it at both ends and on one side of the frame. The polythene on the other side of the frame should not be nailed down completely so as to leave an opening to keep the food inside the drier.

Cut a 10 cm diameter hole in the polythene at the top of each end. Put the drier in a sunny place and keep four stones around its base, to keep it steady. Keep the food on a raised drying rack, as shown in the figure 6, and put it inside the dryer.

WORKING : Cut the fruit into thin slices, after taking the skin off. In case of beans or corn, wash and dry them with a cloth. Peanuts, on the other hand, must be dried in their shells.

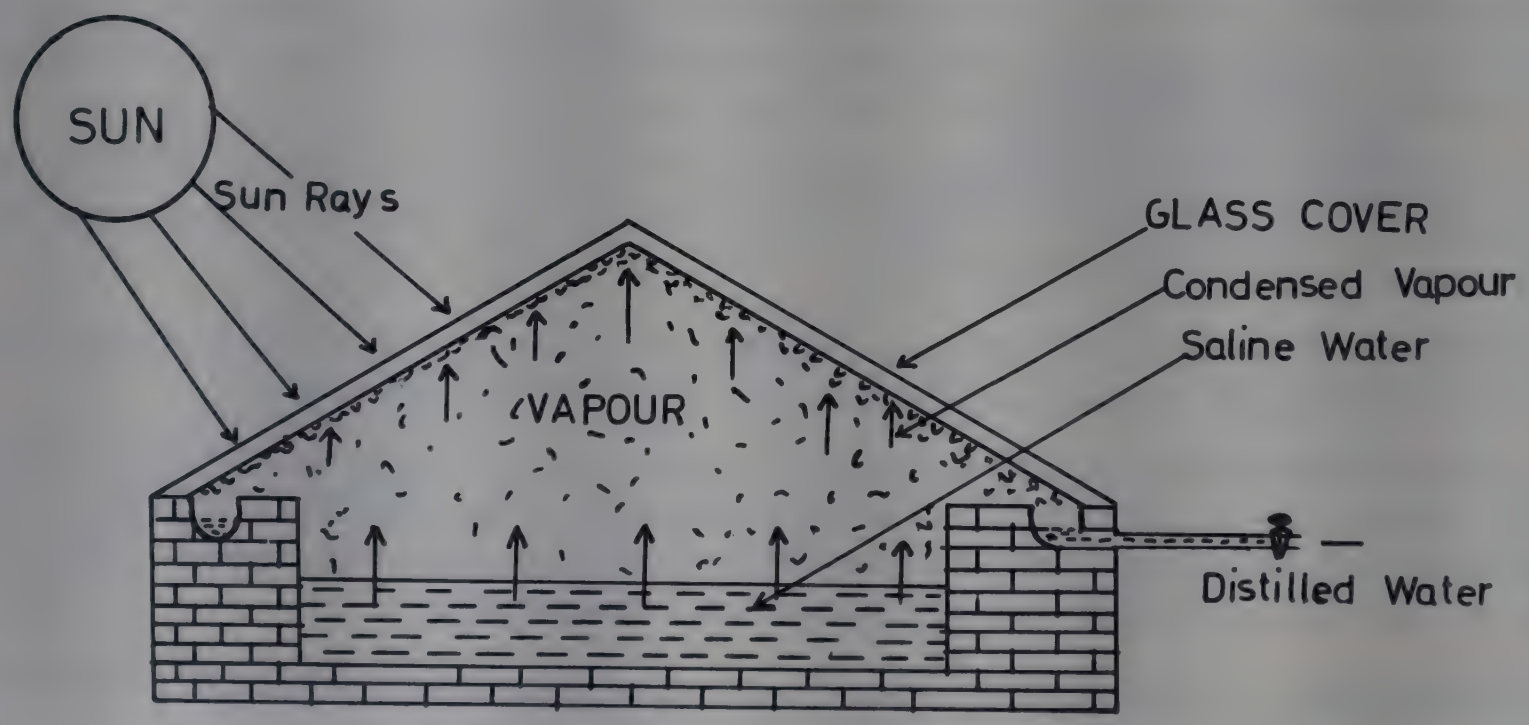
Lay the treated vegetables or fruits on trays and turn them over once a day for proper drying. When the vegetables are dry and hard (after 3 or 4 days depending on the weather), take them out of the drier and pack them in air-right containers. Fruits are generally ready when they are hard on the outside but soft on the inside. Peanuts can take upto 2 weeks to dry.

ADVANTAGES : 1. Drying vegetables: beans, corn, peanuts, pumpkin. 2. Drying fruits: pineapples, bananas, '*khubani*', and apples. 3. Drying fish after it has been salted.

COST : Rs. 150 to 200/- (approx.)

SOURCE : SPATF
P.O.BOX 6937
BOROKO
PAPUA NEW GUINEA

SOLAR WATER STILL



TECHNOLOGY NO. 9

SOLAR WATER STILL

DESCRIPTION : Rural women, especially those living in saline water regions have a hard time collecting drinking water and purifying it for making it potable. Solar Water Still purifies brackish water by utilising the sun rays — hence a simple, inexpensive and sustainabale renewable energy technology.

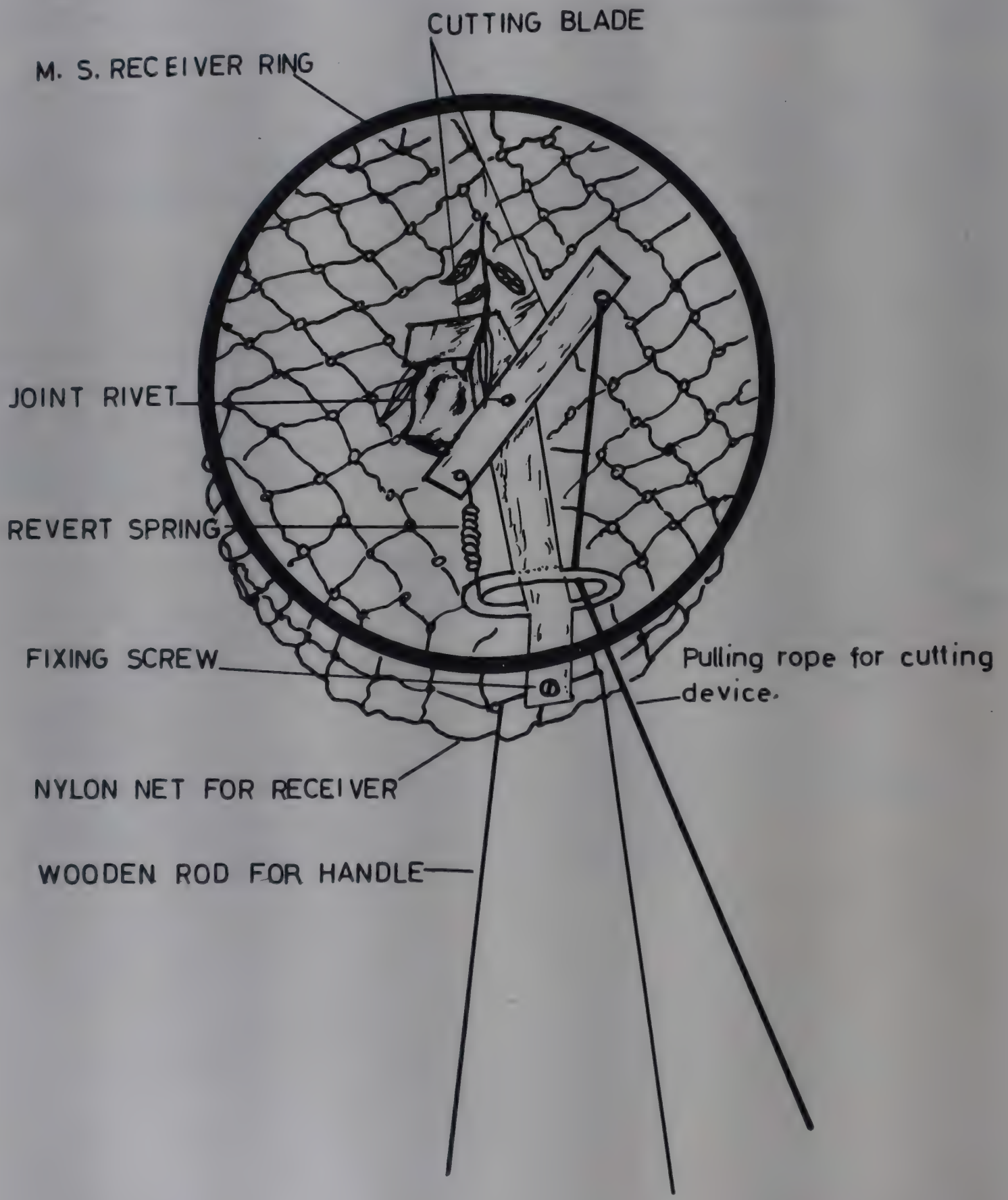
CONSTRUCTION : Solar Water Still comprises a small shallow tank of the desired capacity, constructed from entirely indigenous materials which are locally available. The bottom of the tank is painted with suitable black paint. The tank is covered with glass sheets, by propping up wooden supports to form a sloping roof over the tank. Central portion of the still is kept high and the glass sheets touch the side walls.

WORKING : This technology is based on the simple evaporation-condensation principle by the virtue of which the sun evaporates the sea-water and then condenses it to culminate into pure rain water. Saline water is fed into the tanks which is exposed to the sun. The black bottom of the tank absorbs solar energy and gets heated. The heat evaporates the tank water which condenses on the glass sheet and finally converts into drops of pure drinking water. This purified water collects in the channel running through a tap. Hence, you get clean hygienic drinking water by simply turning on the tap and storing this water for further usage. The average output of the still is 2 to 3 litres of drinking water per day per square metre of the area.

COST : Rs. 300/- (approx.) Cost of the Still varies with the desired size.

SOURCE : CENTRAL SALT & MARINE CHEMICALS RES. INSTT.
(CSMCRI), GIJUBHAI BADEKAR MARG
BHAVNAGAR - 364 002
GUJARAT

STEEL FRUIT CUTTER



TECHNOLOGY NO. 10

STEEL FRUIT CUTTER

DESCRIPTION : This high-carbon steel fruit cutter is a handy implement as it cuts the fruit and collects it as well, at the same time. It is a portable tool which can be easily attached to any long pole for plucking operation.

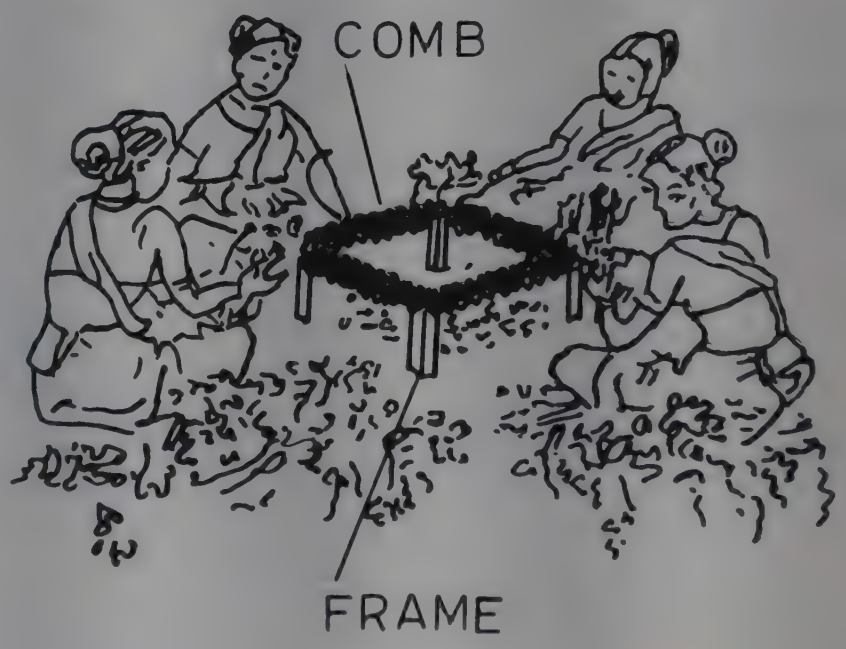
CONSTRUCTION : The steel fruit cutter comprises of two high-carbon cutting blades of mild-steel. One blade is fixed to the receiver ring and the other is joined to it by a joint rivet (see illustration). This flexible blade is connected to the ring with a revert spring at one end. It's other end is tied to the end of a rope which passes through a loop at the non-operating end of the fixed blade. A nylon net is tied to the receiver ring. This whole attachment is tied or screwed to a bamboo pole.

WORKING : Lift up the pole with one hand and hold the rope with the other. Bring the fruit (to be plucked) between the cutting blades and pull the rope with a jerk to cut the fruit. The fruit gets cut (at the stem) and falls into the net below.

COST : Rs. 50/- (approx.)

SOURCE : L. GYANESHWAR SINGH
KANGABAM LEIKAI, IMPHAL-795 001
MANIPUR

GROUNDNUT STRIPPER



(MANUALLY OPERATED COMB TYPE)

TECHNOLOGY NO. 11

COMB TYPE GROUNDNUT STRIPPER

DESCRIPTION : The Comb-type Groundnut Stripper is a manually operated agricultural equipment for detaching pods from groundnut vines.

CONSTRUCTION : The sieve comprises of a rectangular frame consisting of vertical pegs and a horizontal strip of expanded metal fixed on each side of the frame, in the shape of a comb.

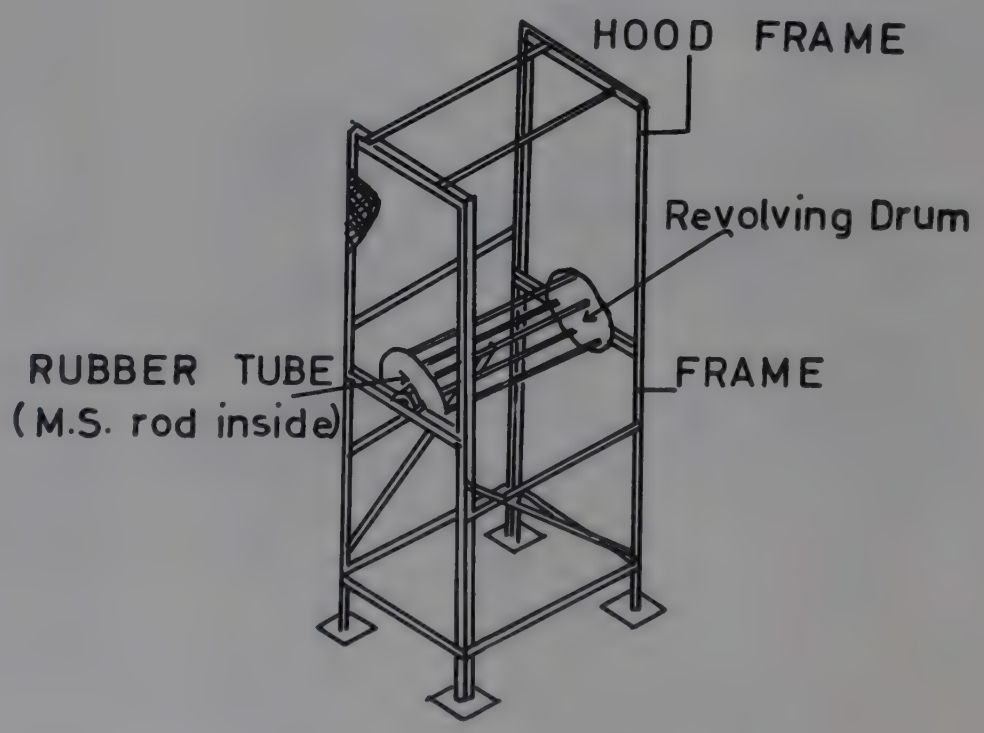
WORKING : The operation commences by drawing a handful of groundnut wines across the comb with some force which culminates in stripping of the pod. Four women can conveniently utilize this device at one go. This equipment strips 2-3 quintals of pod, with 4 workers doing the job simultaneously.

COST : Rs. 125/- (approx.)

SOURCE : THE HEAD
DEPT OF AGRICULTURAL PROCESSING
COLLEGE OF AGRICULTURAL ENGINEERING
TAMIL NADU AGRIGULTURAL UNIVERSITY
COIMBATORE - 641 036
TAMIL NADU

GROUNDNUT STRIPPER

(DRUM-TYPE)



TECHNOLOGY NO. 12

DRUM TYPE GROUNDNUT STRIPPER

DESCRIPTION : This device can be operated signle-handedly by just one person and is quite useful in minimising the post-harvesting losses.

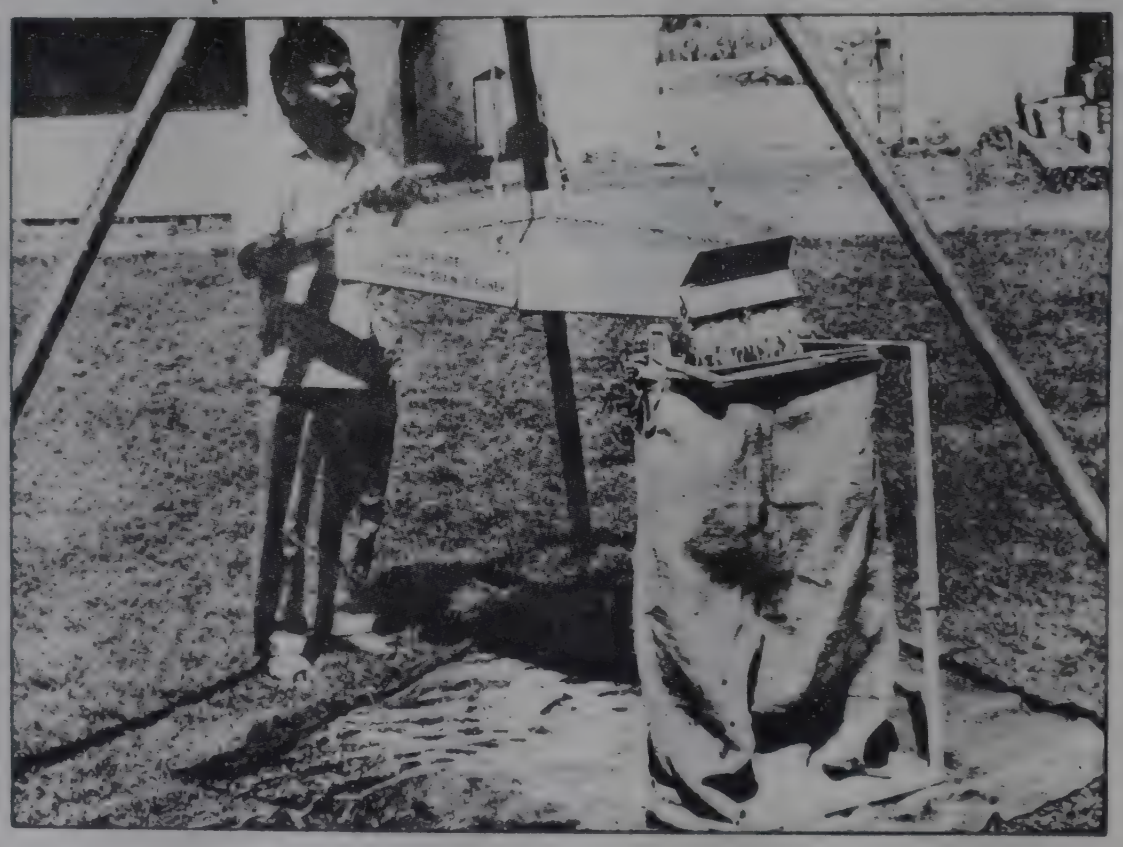
CONSTRUCTION : Drum-type Groundnut Stripper consists of a hollow drum constructed with two metal discs, connected by mild-steel rods covered with tubes made of rubber. This drum is fixed on a frame and mounted on a pedestal bearing for rotating freely.

WORKING : The operator stands and beats the root portion of a handful of groundnut vines on the drum, which is fixed to the frame at a convenient height. To avoid the scattering of pods, a hood frame is also provided and the roof, alongwith the three sides, is well-covered with canvas. One woman can carry this portable, manually - operated, groundnut stripper. It has a capacity to strip 20 kgs of pots in one day.

COST : Rs. 250/-

SOURCE : THE HEAD
DEPT OF AGRICULTRAL PROCESSING
COLLEGE OF AGRICULTURAL ENGINEERING
TAMIL NADU AGRICULTURAL UNIVERSITY
COIMBATORE - 641 036
TAMIL NADU

HAND OPERATED GRAIN CLEANER



TECHNOLOGY NO. 13

HAND OPERATED GRAIN CLEANER

DESCRIPTION : The hand-operated grain cleaner is used for sieving out foreign matters from Bengal gram, grain (wheat) and soyabean.

CONSTRUCTION : This grain-cleaning device has the advantage of having double screens. The cleaner is shaped like a cradle and is operated manually. The grains get separated from the foreign matter due to difference between their respective sizes. The total length of the device is 900 mm, with a width of 600 mm and a height of 140 mm. The total weight of this post-harvest equipment is 14 kgs.

WORKING : This implement can be operated by just one person without any problem. The process is very simple. About 5-10 kgs of the grain is fed into the cleaner in each batch and the cradle-like-cleaner is given a few swings for separation purposes.

The impurities remain in the top-sieve due to the bigger size and the clean grain slips down into the sieve at the bottom. Out of this clean lot, still finer impurities are screened out to attain a cleaning efficiency of 99 to 99.8%. The screened grain is collected in a gunny sack. Precaution, however, should be taken to hang the cleaner securely from a tripod stand or a beam.

COST : Rs. 325/- (approx.)

SOURCE : DIRECTOR
CENTRAL INSTITUTE OF AGRICULTURAL
ENGINEERING, NABI BAGH
BERASIA ROAD, BHOPAL - 462 018
MADHYA PRADESH.

TECHNOLOGY NO. 14

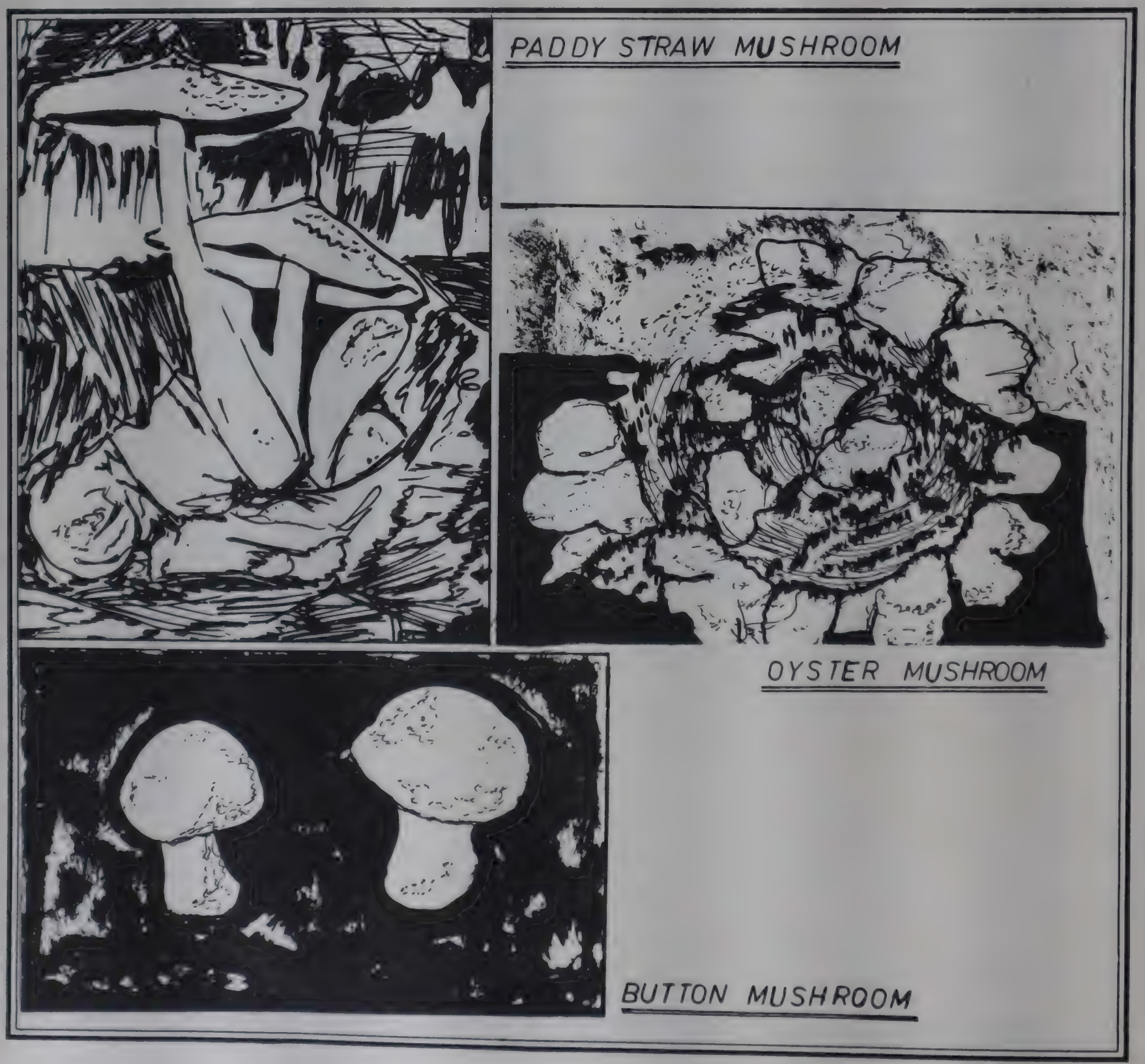
MUSHROOM CULTIVATION

DESCRIPTION : Mushrooms are a source of high quality proteins, essential minerals and vitamins. Being low in starch content, they are good for diabetic patients. Mushroom is grown on agriculture residues like straw, leaves, and sticks which (after use) can be recycled back as organic manure. Mushroom cultivation demands no land but closed structure, which can even be a thatch-hut. It can be a remunerative cottage industry for rural women.

CULTIVATION :

Tissue Culture Method

Select fresh mature mushrooms (straight from the bed), wash them gently under running water to remove surface dirt. Blot it dry. Wipe the surface gently with 70 per cent alcohol. Using a sterile knife, cut a small slit at the bottom



of the mushroom. Tear it into two halves and avoid touching the inner surface. Transfer a few pieces of tissue (Pseudoparenchyama) from the centre of the mushroom to the media in plants.

Spore Culture Method

The surface of a mature (open) mushroom should be disinfected by wiping gently with 70 percent alcohol. Remove the spore and place the cap with gills downwards on a piece of sterile white paper. Cut a tiny piece of spore print and soak it in a few ml. of sterile tap water. Dip a sterile innoculating loop into this spore suspension and streak gently across the surface of an agar plate. Incubate the plate for a few days and a white mycelial (white thread like structure) mass resulting form the growth of germinated spores becomes evident.

Preparation of Spawn

Cook the grains (rye/sorghum/maize/wheat) in water until they are ready to burst. Drain off excess water. Mix in 2 percent (w/w) lime (calcium carbonate), fill loosely into glass bottles and plug with cotton. Sterilize them in an autoclave for 30 minutes at 121°C and allow it to cool. Innoculate the bottles with the prepared pure culture and incubate at 25°C for 10-15 days. When the whitish mycelium has spead over the surface, the spawn is ready for use.

MATERIALS : For 100 kg Mushroom production - Dry paddy straw (not more than one year old) -100 kg; gram powder-2 kg; spawn bottles-10; polythene bag-1 kg; water and a shady structure.

Preparation of Substrate

Use Dried paddy straw, 500 gms per bed (Hulled maizecob, sugarcane bagasse, cotton waste, paper waste, etc. can also be used instead of paddy straw). Cut the paddy straw into small bits of 3 to 5 cm. and soak it in cold water for 6-8 hours. Take it out and then immerse in boiling water for 15-30 minutes and drain off excess water. Dry the straw in the shade for 2 hours and then use. Remove the spawn from the bottle using a small iron rod wih hook on one side. Dip the iron rod in antiseptic solution before use. Separate the spawn into four lots. Fill the first layer with straw bits upto 5 cm height in the bottom of the polythene bag. Sprinkle spawn over the entire surface of the straw layer. Add second layer with the straw bits upto 10 cm height and sprinkle spawn as before. Similarly, repeat the spawning for third and fourth layers of straw bits. Then, fill the final layer with straw bits upto 5 cm height.

After spawning the beds keep the beds in the growing room for spawn running. Keep bags in the dark for a period of twenty days. White mycelial growth appears throughout the bed.

Cropping & Harvesting

After the spawn running period (nearly 15 days), remove the polythene cover and keep in the rack. The relative humidity is maintained above 75% by spraying water on the floor and gunny screens, but watering the beds is avoided for first two days.

After two days, sprinkle beds with water twice daily. Allow aeration and light for 20-30 minutes in morning and evening by opening windows of the growing room.

First harvest can be made 24 to 26 days after spawning. Harvest fully-opened mushroom before the edge of the top rolls downward. Two to three harvests can be taken at 7-10 days interval. The yield is about 35 to 85 percent of the substrate (w/w).

COST : Cost of Production of 1 kg. Mushroom is Rs. 5/-

SOURCE :

1. SRI D.N. GOYAL KAVAI FOODS PVT LTD
   1/8-C ABDUL RAHIM ROAD
   RACE COURSE COIMBATORE-641018
   TAMIL NADU

2. HEAD, DIVISION OF MYCOLOGY
   AND PLANT PATHOLOGY
   INDIAN AGRICULTURAL
   RESEARCH INSTITUTE
   NEW DELHI-110012

3. DIRECTOR
   MUSHROOM LABORATORY
   COLLEGE OF AGRICULTURE
   CHAMBAGHAT, SOLAN-173213
   HIMACHAL PRADESH

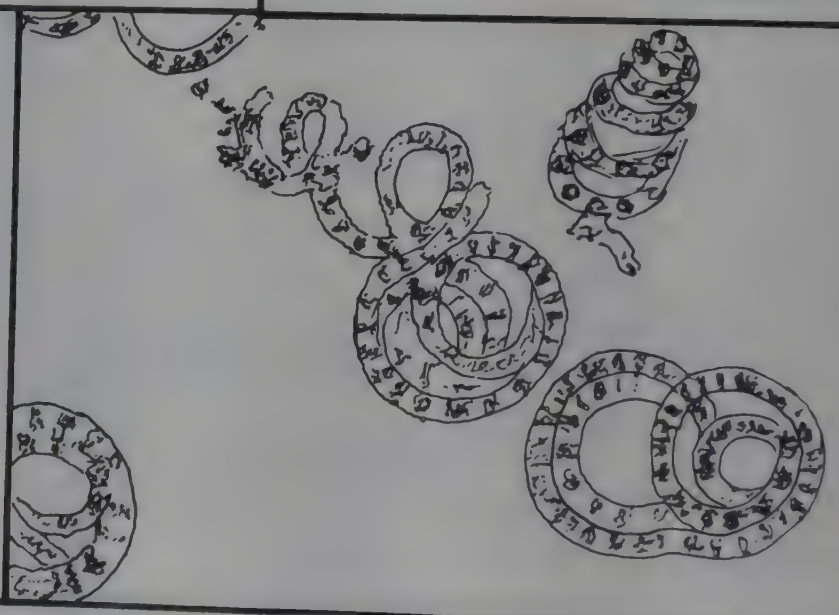
4. DIRECTOR
   MUSHROOM RESEARCH LABORATORY
   SANAT NAGAR
   SRINAGAR-190 005

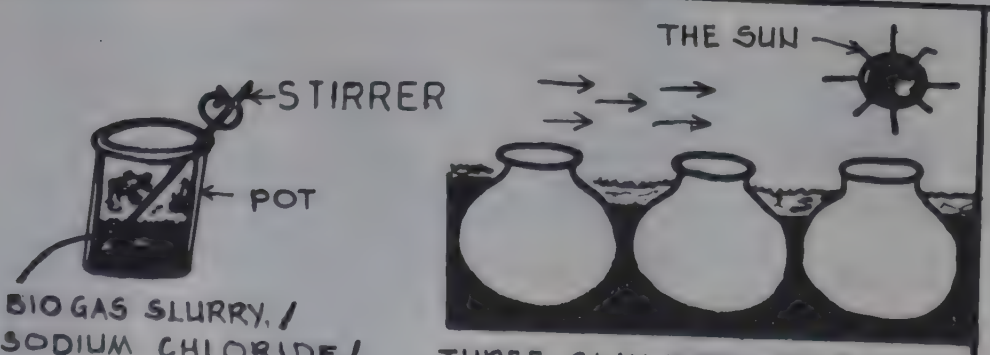
5. DR. MEERA MADAN
   CENTRE FOR RURAL DEVELOPMENT &
   APPROPRIATE TECHNOLOGY
   INDIAN INSTITUTE OF TECHNOLOGY
   HAUZ KHAS, NEW DELHI- 110 016.

SPIRULINA

SPIRULINA CULTURE

MICROSCOPIC VIEW OF SPIRULINA





METHOD OF GROWING SPIRULINA IN POTS

TECHNOLOGY NO. 15

MUD POT SPIRULINA CULTIVATION

DESCRIPTION : Spirulina is an edible micro-algae. It is toxic-free, rich in proteins and vitamins and has a high medicinal value. A simple and cheap technology has been developed for rural women to cultivate spirulina at home, requiring little space and investment. This can be a profitable industry as dried spirulina can be sold at about Rs. 300/- per kg.

MATERIALS : Three mud pots of 35 to 40 litre capacity/2.5 sq.m. of exposed and protected space.

MEDIUM : Bio-gas slurry and 2-3 grams of sea salt or chemical medium (Potassium dihydrogen Phosphate, Cooking Soda and Sodium Chloride); and Pure Spirulina Culture.

WORKING : The three mud pots are buried upto their necks in the ground, filled with water mixed with the medium. Bio-gas slurry is the cheapest nutrient medium for spirulina culture. A small quantity of pure spirulina is put into the medium. (In the initial stage, the nutrient medium has to be supplied to the producer as stock-solution for ready mixing). The medium has to be stirred 3 to 4 times a day as the spirulina can not grow in a stagnant medium. The pots have to be exposed to sunlight as the spirulina takes 3 to 4 days to mature. The mature spirulina (When the pale medium turns into dark green) can be harvested by a simple cloth-filtration. After washing the spirulina in fresh water (to remove the adhering chemicals), it can be directly mixed with the chapati/dough, chutnies, noodles, dals, vegetables etc. (about 2% by weight). Spirulina can be preserved by drying it in the shade. It must be dried immediately to preserve its quality and value.

ADVANTAGES : Spirulina grown in 3 earthen pots of 35-40 litre capacity is sufficient to provide 2 grams per day (per person) high-quality spirulina powder to meet 100% vitamin A and 200% vitamin B-12 requirement, daily.

- Pots are easy to handle as compared to concrete-lined ponds or polythene-lined pits.
- Pots can be replaced easily, if damaged, and can be shifted, if necessary.
- Pot-cultures can be maintained for long periods if no infection, contamination, or other mishaps occur.
- More pots can be manufactured by village women with minimum additional effort.

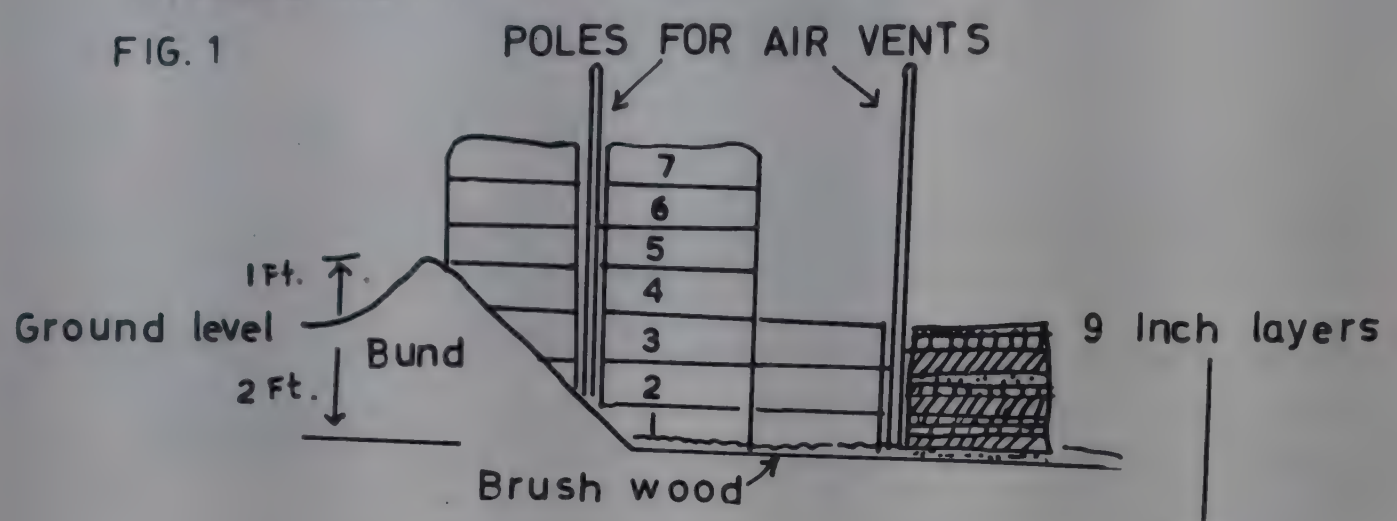
COST : Rs. 100/- (approx.)

SOURCE : DR. C.V. SHESHADRI
AMM MARUGAPPA CHETTIAR RESEARCH CENTRE
ALGAL DIVISION
SAVERIVYAR PURAM
PUDUKKOTTAI DT
TAMILNADU

INDORE COMPOSTING METHOD

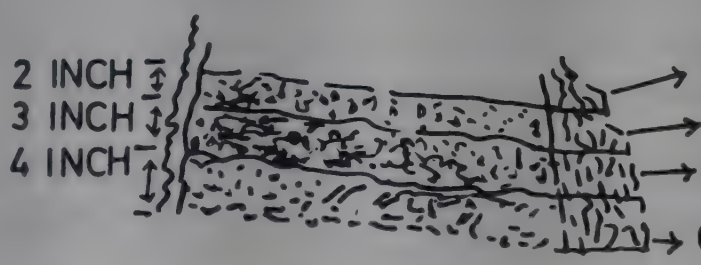
Finished section of 7 layers

FIG. 1



Compost heap showing layers of ingredients.

FIG. 2

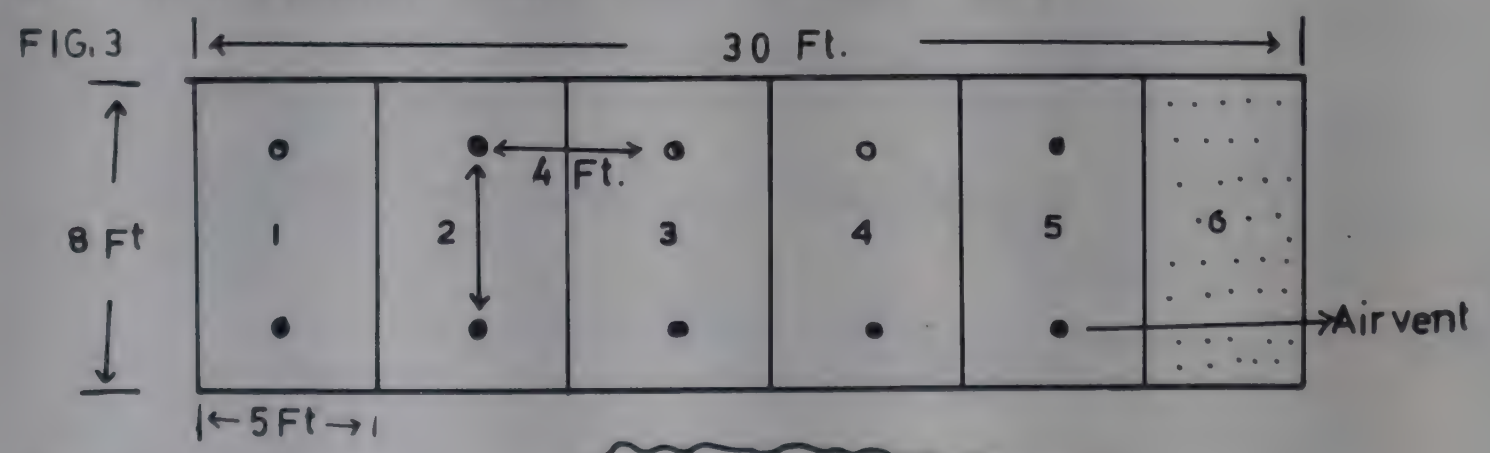


Each 9 inch layer is composed of

- Urine earth/wood ash
- Manure
- Green weeds & leaves
- Coarse dry waste.

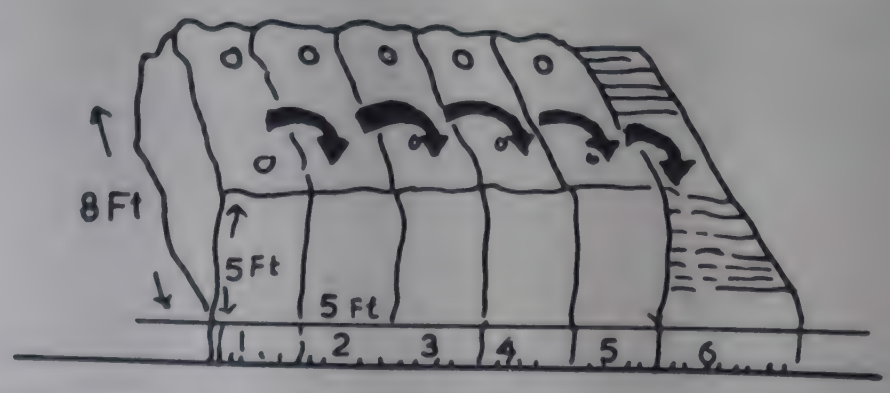
PLAN VIEW SHOWING COMPLETED COMPOST HEAP

FIG. 3



Turning the heap

FIG. 4



TECHNOLOGY NO. 16

INDORE COMPOSTING METHOD

DESCRIPTION : The Indore Composing Method is an ideal system of preparing organic manure or compost which replaces chemical fertilizers and enhances the crop-yield, without any ill side-effects.

METERIALS : Stalks of cotton, maize, millet and the pulses. (Ideally they should be chopped to a particle size below 2 inches).

CONSTRUCTION : Start building the heaps by laying a lattice of old branches at the bottom. Divide the base area of the heap into 6 (roughly equal) transverse sections, five of which are filled and one left vacant. Make each section of 7 layers (Figure - 1) of 9 inch thickness. In a 9 inch layer, have 4 inches of dry waste, 3 inches of green weeds and leaves, 2 inches of manure and a sprinkling of urine-earth-wood ash. (The layering process is illustrated in Figure-2).

Make ventilation holes after completing two layers of a section. Take a 6-8 ft long pole with a 2 inch diameter and probe vertically through the working, gradually increasing the size of the hole to 4 inches by waggling the pole. See that the pole remains in its position and ensure that the air- vent continues to the top of the completed section. The first pole should be at a distance of not more than 2 feet from the heap, with a maximum distance of 4 feet between two successive holes.

Continue building of the section up to a height of 5 feet, after establishing the air vents. Build five sections in the similar manner, leaving the sixth one vacant. (The sixth one is utilized while turning the heap.) Water the heap, lightly, just after completion and again the next morning.

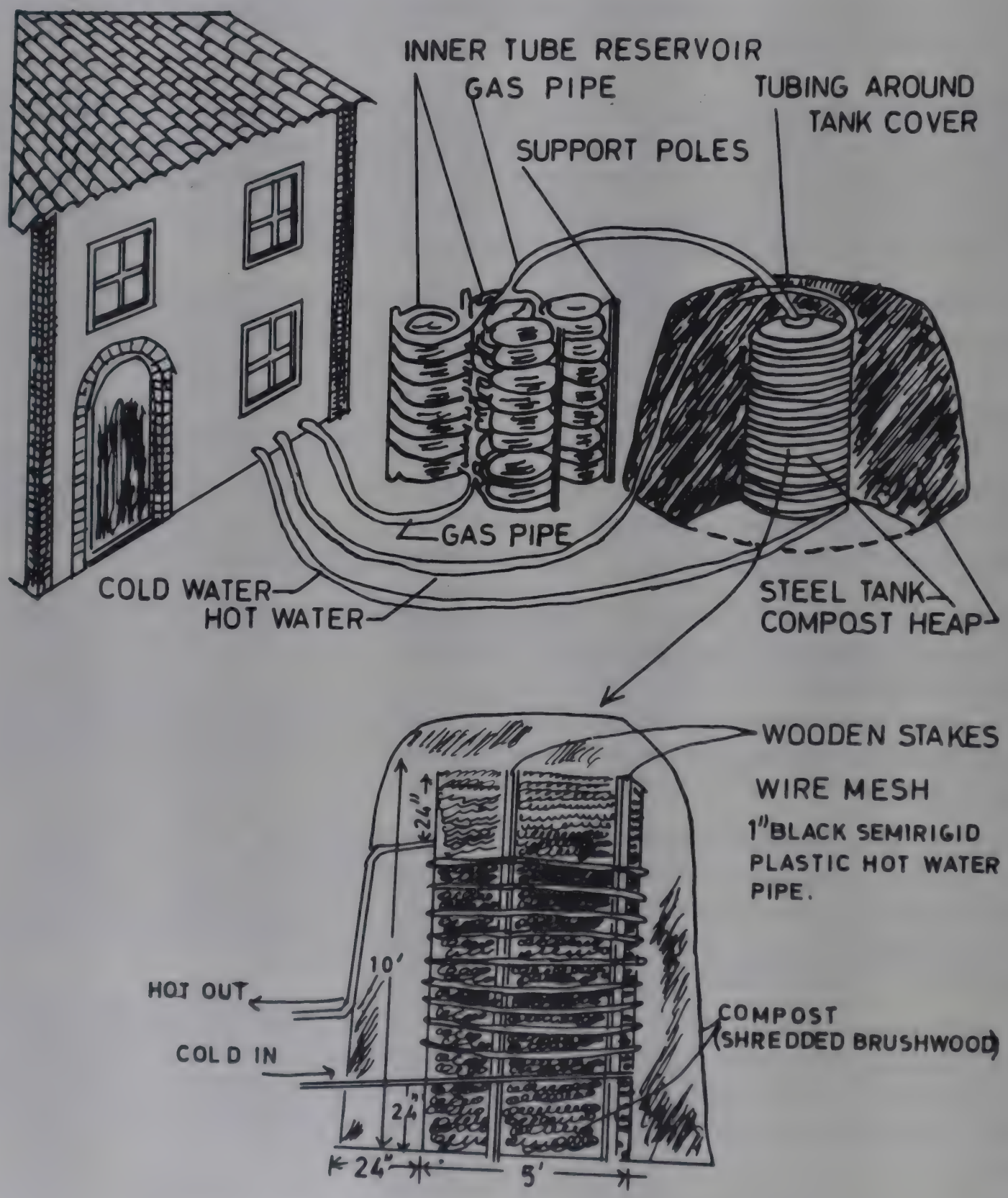
WORKING : The central portion of the compost heap gets heated to its maximum temperature, within one week of its completion. The material in the cooler region composts slowly and the weeds, seeds and diseased material may not be completely decomposed. Hence, it is vital to turn the heap so that the cooler top, bottom and sides get mixed back into the middle of the new heap, once the temperature at the centre begins to drop. Turning also facilitates thorough mixing of the ingredients and their aeration.

Carry out the first turning two weeks after construction of the heap. Put the top 9 inches from section 5 into the floor of section 6, mixing it in the process. Cover it with the next 9 inch layer and water it. Re-establish the air vents before proceeding further. Switch section 4 to Section 5, once Section 5 is completely turned over into Section 6. Keep turning over each section into the next one, leaving Section - I blank (Figure -4).

Carry out the second turning after 3 weeks. A third turning is realized only if the original materials are recognizable, after 9 weeks. It takes around 12 weeks for final composting, though a little longer during monsoons. The final product has a pliable texture, an earthy smell and is dark brown or grey in colour. This matured compst is half of its original volume as it simply shrinks due to the cooling process.

SOURCE : CENTRE OF SCIENCE FOR VILLAGES
MAGAN SANGRAHALAYA
WARDHA - 442 001
MAHARASHTRA

WORKING OF THE JEAN PAIN PROCESS



THE CYLINDRICAL THERMAL COMPOST PILE

TECHNOLOGY NO. 17

JEAN PAIN COMPOSTING

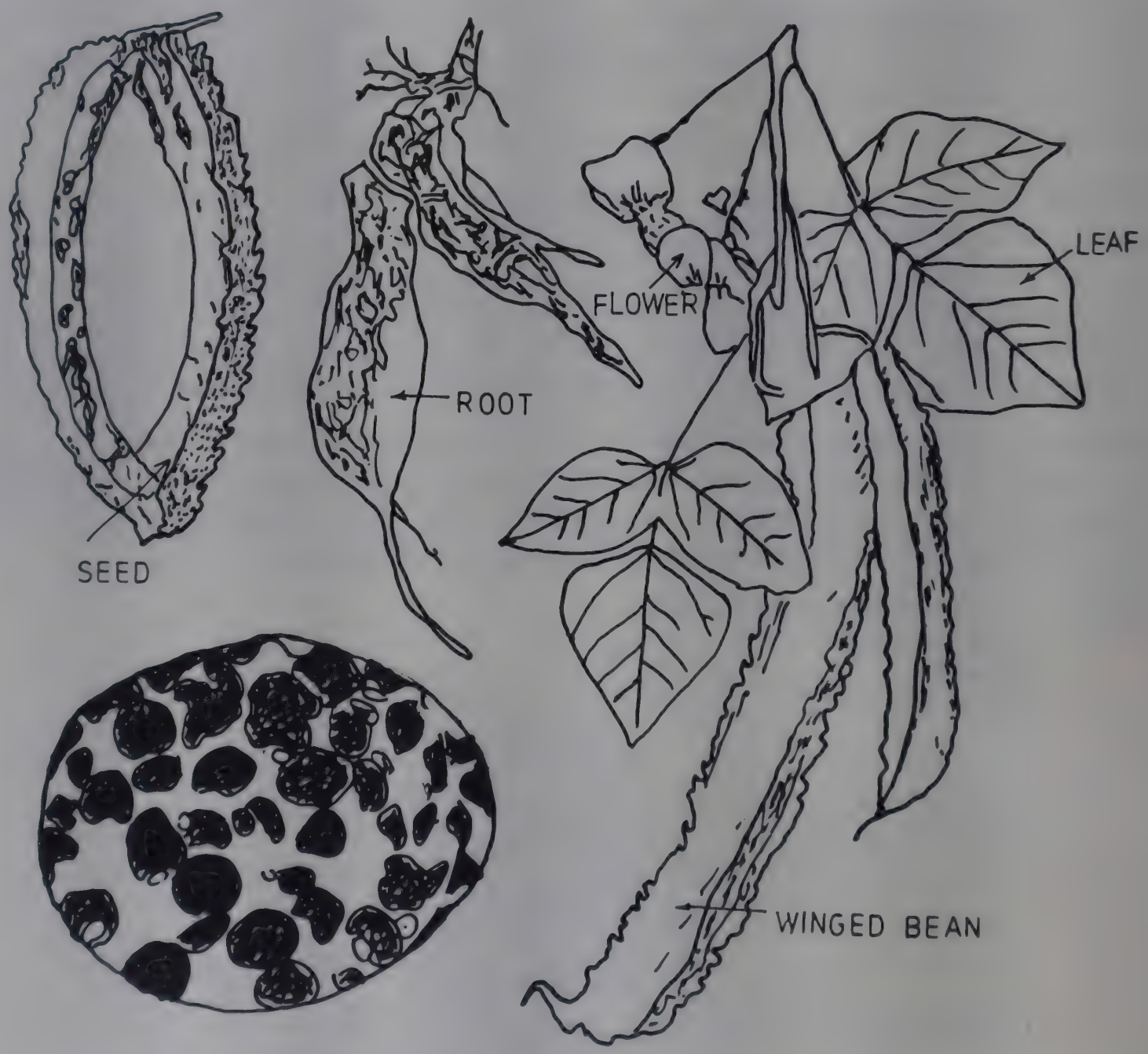
DESCRIPTION : Jean pain process is an amazingly simple and incredibly inexpensive system of extracting both energy and fertilizer from plant life. This process is a boon for rural women since it goes a long way in overcoming the shortage of fuel, especially in hilly ares.

CONSTRUCTION : This power plant supplies 100 percent of a rural household's energy needs. It is a mound of tiny brushwood pieces (3 metres high and 6 across). This compost mound is made of tree limbs and pulverized underbrush. The 50 ton compost, is a steel tank with a capacity of 4 cubic metres. It is three fourths full of the same compost, which has first been steeped in water for 2 months. The tank is hemetically sealed, but is connected by a tubing of 24 truck tyre inner tubes, banked near by a reservoir for the methane gas produced as the compost ferments.

WORKING : Once the gas is distilled — washed through small stones in water and compressed, it is used for cooking food and producing electricity. (It can even fuel a truck as 10 kilos of brushwood supply the gas equivalent of a litre of petrol). It takes about 90 days to produce 500 cubic metres of gas — enough to keep two ovens and three burner stoves going for a year. The methane-fuelled combustion engine, that turns a generator, produces 100 watts of electricity every hour. This charges an accumulative battery which stores the current, providing all the light needed for the household. A 200 metre long plastic tube, wound around the tank, provides hot water at 60 degrees centigrade for 18 months due to the heat-giving fermentation process. Once inside, the hot water circulates through radiators and heats the house during winters. Once the fermentation is over, the fermented compost provides 50 tonnes of nitrogen-rich manure or natural fertilizer.

SOURCE : IDA ET JEAN PAIN LES TEREPLIERS
83930 VILLE CROZE
FRANCE

THE WINGED BEAN



TECHNOLOGY NO. 18

WINGED BEAN

DESCRIPTION : The winged bean is a healthy weaning food due to its highly nutritive value.

The illustration depicts the various parts of the winged bean i.e. tubers, seeds, pods, leaves and flowers. It is claimed that the seeds contain 40% proteins and the roots about 20% proteins, which is supposed to be 10 times more than in potatoes or yams. It also has a high water content of 14 to 25 gms. for every 100 gms.

Winged beans are also rich in carbohydrates and vitamin "A". The creeper can grow on dryland, requiring little water and space. All parts of the plant i.e. seeds, flowers, leaves, pods and tuber-like-roots are edible.

CULTIVATION : The seed before sowing is soaked for a day in hot water. After sowing, it takes 8 to 10 days to sprout. After 8 to 10 weeks, the creeper will bear flowers, violet in colour. Within 4 weeks, tender beans will grow. Pod-bearing will last for 2 to 3 months. One creeper will bear 4 to 5 kilos of beans. By the time florescence stops, the creeper has a well-developed root system. From it, the plant will sprout again in the next season.

ADVANTAGES : Winged bean (pod) can be cooked like any other vegetable. Its tender leaves make good sauce and curry. Seeds of young beans taste like peas, can be eaten raw or cooked. Dried seeds can be roasted like peanuts. The tuber-like-roots are eaten after boiling or frying.

The plant is a good fodder for cattle.

SOURCE : PROF: B.D. TILAK
INDIAN INSTITUTE OF EDUCATION
128/2 KARVE ROAD KOTHRUD
PUNE - 411 029
MAHARASHTRA

TECHNOLOGY NO. 19

WOOD ASH SHAMPOO

WORKING : 500 grams of wood ash is taken and boiled with 1000 ml. of water. The mixture is filtered through a fine cotton cloth. This process is repeated thrice with 1000 ml. of water in order to extract the lye fully from the ash. The collected lye is allowed to settle overnight (to get the lye without any ash particle). The clear decanted lye is boiled for 5 - 10 minutes with 30 grams of Alauric acid. After 5 minutes the thickening agent Coconut Mono Ethyl Amide is added. When still hot (35 - 40 °C), the dye stuff is added. The pH of the shampoo is adjusted to 7 by adding citric acid. Then, the shampoo is scented and bottled.

PRECAUTIONS :

- Never use aluminium utensils and mud pots. Aluminium reacts with the alkali, mud pots absorb the lye and reduce its alkalinity.
- Use pure wood-ash, if it is not pure reduce the amount of water when you make lye solution.
- If the lye is too low in alkalinity, reduce the amount by boiling down, otherwise the lye product will not make good shampoo.
- To obtain clear lye, the lye solution must be kept at least for 8 hours.
- Never keep the lye open, it will absorb the moisture from the atmosphere and get diluted.
- Mineral oil will not make shampoo.
- Excess fatty acid will result in clump formation.
- Never use oil, unless the lye is very high in alkalinity (equal to 7 - 10% of KOH or NaOH).
- If there are any unreacted fats or other chemicals they should be removed by setting shampoo before packing.
- Never use perfumes or colours containing alcohol, as they will fade and cause separation. (The US Dept. of Agriculture recommends small amounts of the following dyes each dissolved into tablespoons of water. Fluorescene for yellow, Naphthol green for green and Rhodamine for red.).
- Dye solution should be mixed with the shampoo when still hot (35°C - 40° C).

HOUSEHOLD MANUFACTURE OF LYE & ALAURIC ACID : Instead of boiling the ash with water the lye can be prepared if one can arrange a set-up as follows: The set can be kept in a corner of the house. The ash (wood ash) obtained as a daily waste product of the household can be kept in the top container and water may be added in sufficient amounts to get a suitable lye. The lye will come slowly in the lower container. The lye can be used once in a week or two weeks, for shampoo making.

Instead of Alauric acid, one can use Litsea Glutinosa (Hindi: Maida Lakdi, Tamil: Mashaippeyhi) seed oil as fat for shampoo making.

COST : Rs. 20/- per litre

SOURCE : SH. A.M.M. MURUGAPPA CHETTIAR
RESEARCH CENTRE
PHOTOSYNTHESIS AND ENERGY DIVISION
THARAMANI, MADRAS - 600 113
TAMIL NADU

TECHNOLOGY NO. 20

LOW COST PRESERVATION OF VEGETABLES

DESCRIPTION : Vegetables like cabbage, cauliflower, green papaya, bean, pea, carrot, turnip, radish, pumpkin etc. can be preserved by this technique up to a period of about three months without much alteration in the nutritive value of the produce.

WORKING : Wash the vegetables thoroughly in clean water. Remove blemishes, rotten part, if any. Shred the vegetables, preferably with a stainless steel knife. Weigh 2 kg. finely (1/8" to 1/16" thick) shredded cabbage and keep it in a clean plastic sheet or container and mix it with 2 kg shredded vegetables (almost any type of vegetables may be used except potato, sweet potato etc.). The proportion of cabbage may be more but not less than 50%. Cabbage contains desirable lactic acid bacteria and the nutrients which help in fermentation. (When cabbages are not available, radishes or cucumbers may serve the same purpose).

Add 22.5 gm of salt (NaCl) per Kg of shredded vegetables. Mix throughly for 3 to 5 minutes. Put the mixture is plastic/earthen/wooden buckets. (Wax lining is necessary for earthen and wooden vats). Press vegetable mix with hand so that brine can come up at the top of the vegetables.

Cover the container with a plastic sheet (200 gauge) which touches the surface of vegetables to avoid contact with air. Pour water (which must not mix with the vegetables) at the top of plastic sheet so that adequate pressure on the vegetables is ensured. Fasten the bucket with a thread around the neck so that the entire system becomes almost air-light.

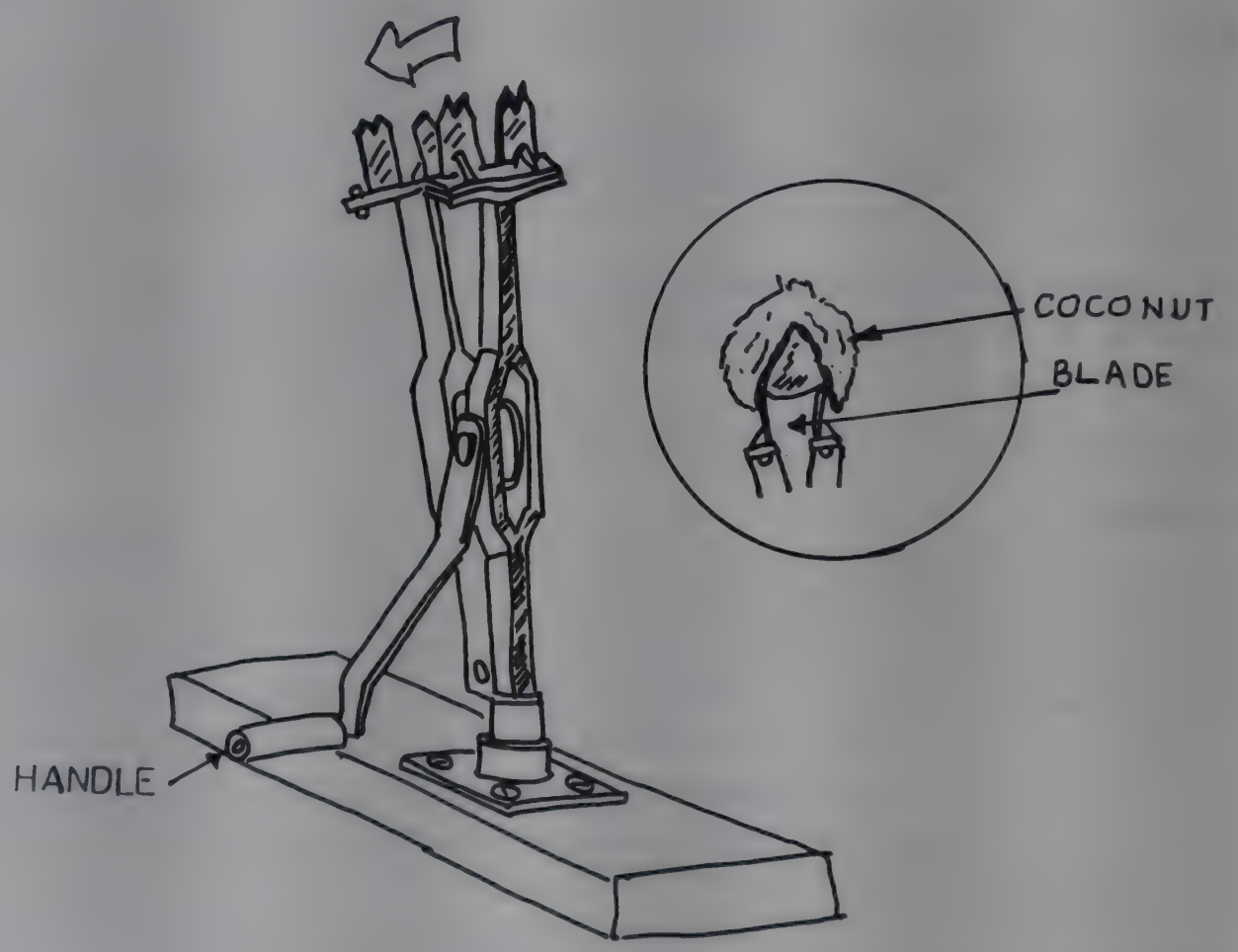
PRECAUTIONS :

- Keep the bucket in a safe place. Don't open the cover of the bucket. This will spoil the product. Vegetables can be kept in this way for a period of about three months.
- Once it is opened, the materials should be consumed on the same day. If it is not possible, special preservation techniques like heat processing (bottling), refrigeration or addition of preservatives may be applied to preserve it for longer period of storage for marketing.
- Vegetables get sour by fermentation. If the product is too sour it may be washed thoroughly in water/hot water to make it free from acid and salt. Boil the vegetables and cook with spices to suit individual taste.

ADVANTAGE : Fermented juice in the vat is also nutritionally sound. This has a characteristic odour and is rich in vitamins B and C. The liquid has mild laxative effect. Heat the juice for a few minutes after adding a little sugar and spices and use as a soft drink. It is also a good appetizer.

SOURCE : DEPARTMENT OF FOOD TECHNOLOGY
AND BIOCHEMICAL ENGINEERING
JADAVPUR UNIVERSITY
CALCUTTA - 700 032

COCONUT DEHUSKER



TECHNOLOGY NO. 21

COCONUT DEHUSKER

DESCRIPTION : The traditional method of cracking a coconut to separate its husk and shell is very primitive and inefficient, even though today the Copra processing industry uses highly technical methods for other operations. In view of this fact, a simple tool has been developed by CECOCO. It will crack approximately 100 to 200 coconuts per hour.

WORKING : The coconut is struck manually against the close-toothed blades. Next the handle is turned around and the clamp action snaps the coconut into two pieces. One or two subsequent operations are needed to separate the core completely.

COST : Rs. 150/-

SOURCE : CECOCO
CHUO BOEKI GOSHI KAISHA
P.O. BOX 8, IBARAKI CITY,
OSAKA, JAPAN

TECHNOLOGY NO. 22

MILK PRESERVATION TECHNOLOGY

DESCRIPTION : This simple milk processing technique can preserve milk safely for one full year. Hence, it is very useful in providing additional family income to rural women through self-employment.

WORKING : The fresh milk is heated to a temperature of 60°C. Sugar and other flavours are added before being transferred to milk bottles. The bottles have to be thoroughly cleaned with a detergent or sand and rinsed well in hot water. Milk should be filled leaving a gap of 5 cms from the mouth of the bottle. The bottles are made air tight with crown corks using a manually operated machine. After checking for leakages they are placed in an autoclave or domestic pressure cooker. The autoclave or cooker is heated to 110° C - 115°C under 6.5 kg pressure for 4 - 5 minutes. The autoclave is then removed from the fire and kept on the floor for cooling. The bottles are removed and stored on a shelf in a cool place. These bottles should be checked after every 2 - 3 days. If any bottle shows signs of contamination it should be removed from the shelf (precipitation or change in colour). The properly sterlized milk remains usable for about a year under ordinary conditions. The remaining bottles should then be packed carefully so that the corks do not become loose during transportation and be exposed to contamination.

COST : Rs 1.50 for processing one litre milk

SOURCE : CENTRE FOR RURAL DEVELOPMENT
AND APPROPRIATE TECHNOLOGY
(CRDAT), INDIAN INSTITUTE OF TECHNOLOGY
(I.I.T.), HAUZ KHAS
NEW DELHI - 110 016

VERMICULTURE

EARTHWORM

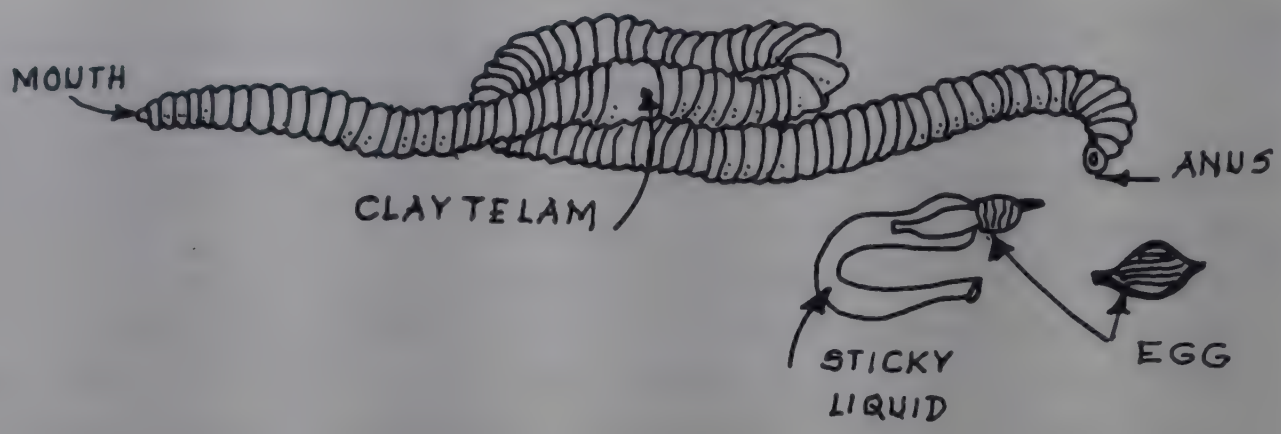


FIG-1

COLLECTION OF MANURE

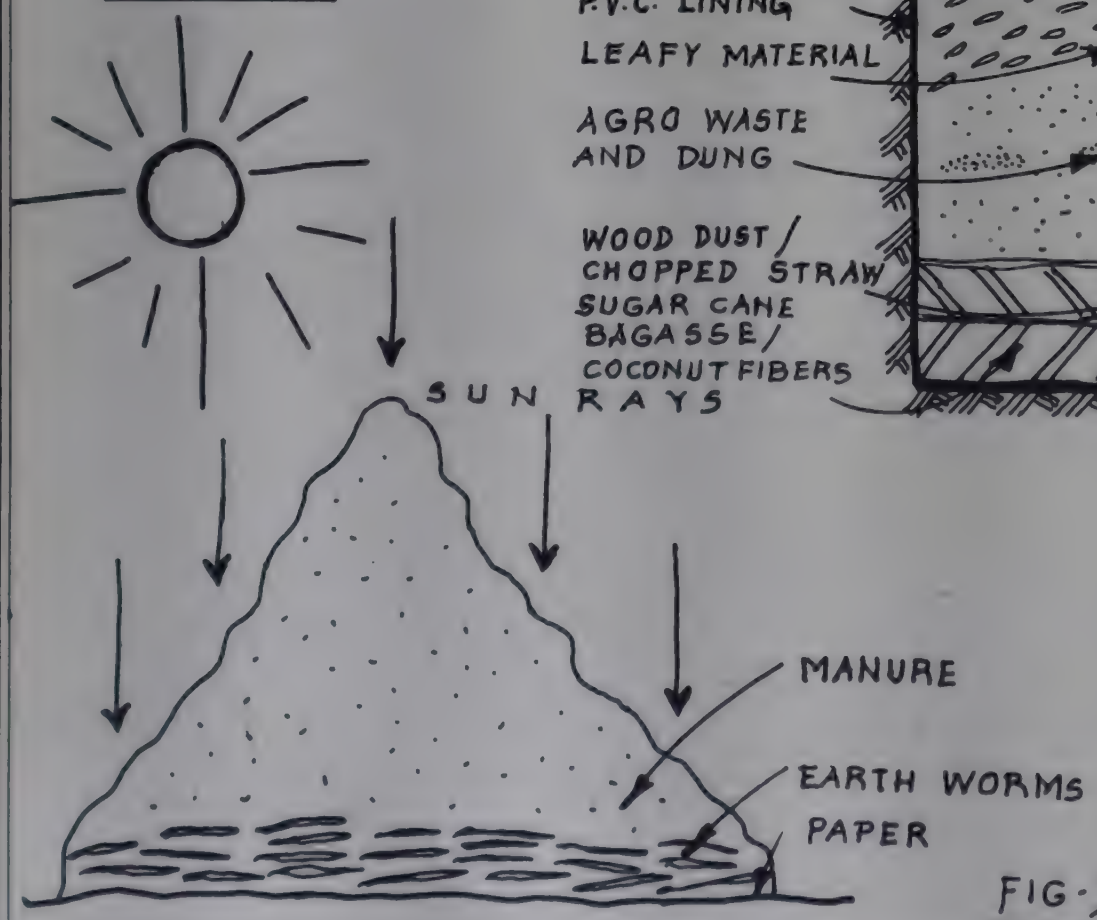


FIG-3

FILLING OF PIT

(PIT SIZE 2'-0" x 2'-0" x 1'-6")

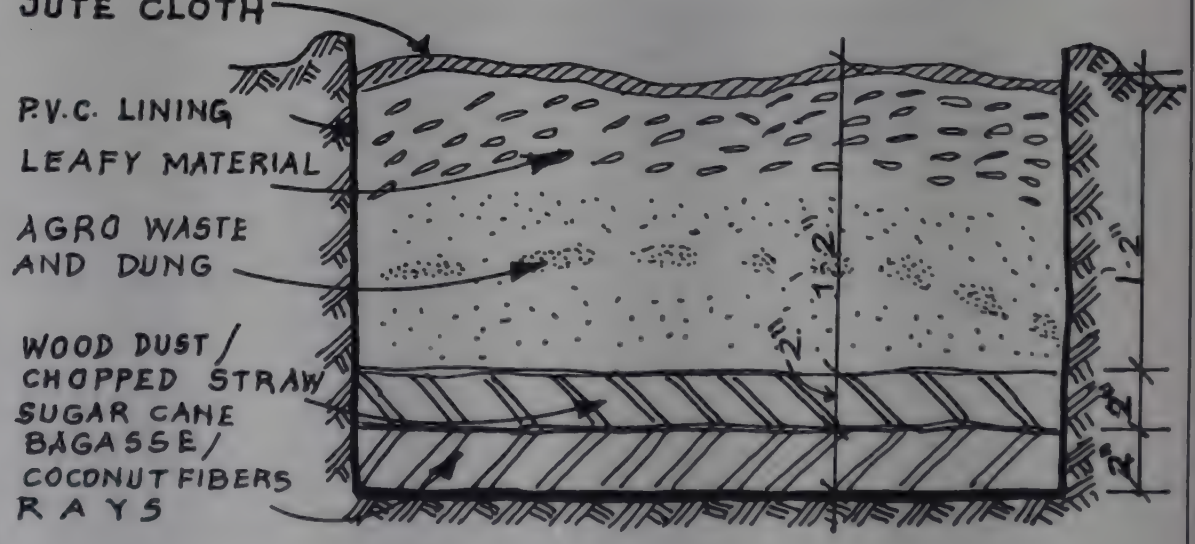


FIG-2

TECHNOLOGY NO. 23

VERMICULTURE

DESCRIPTION : Vermiculture can be a lucrative economic activity for rural women. Earthworms can be bred in their farm or courtyard to produce organic manure. Earthworms multiplied by this technology can be sold directly as animal feed specially for poultry, fishery and dairy farms. Pharmaceutical companies buy them for drug extracts.

WORKING : Select a place away from direct heat, strong sunlight and incessant rains. Dig a pit measuring 2 feet x 2 feet x 2 feet. Line the pit with polythene (PVC) sheet to arrest escape of earthworm through crevices. (Earthen pot, Brick, Cement tank or Wooden boxes can also be used to house earthworms)

The pit is systematically filled with four layers of waste. First layer — (Bottom of the pit) is filled upto 2 inches with coconut fibre, rice husk and sugar cane bagasse. Second layer is 2 inches thick, consisting of saw dust, chopped rice/wheat straw. Dampen the bed by sprinkling water. Third layer is the earthworm food, this includes an admixture of cow-dung, green foliage, vegetable remnants, discarded parts of fruits, droppings of horses, asses, pigs, sheep or biogas slurry, human excreta, paper or scrap of cardboards etc. This feed should be spread till a height of 6 to 8 inches.

Release about 100 earthworms on the top without hurting them. These earthworms will start penetrating to the bottom. Once all these earthworms disappear, cover the surface with jute bags and keep them wet by sprinkling water in a judicious way.

The jute bags may be turned upside down thrice in the first week, twice in the second week and only once in the third and following weeks, without causing any disruption to the top.

Water and heat inside the tank assist the organic matter to decay & proliferates the number of earthworms — both these take place simultaneously. By 4 to 5 weeks, production of heat inside the pit will cease and will come down to 60°‡ to 65° Fahrenheit. In case no warmth is felt by hands, understand that the manure is almost ready for use. From one tank, 50 kg. of manure is produced.

Spread a paper on the ground and empty the contents of the tank slowly in sunlight making a pyramid like heap. Let this heap remain in daylight for about half to one hour. This will induce the earthworms to penetrate deep and reach the bottom. Now the upper layers of organic manure can be lifted slowly. Later the earthworms at the bottom may be separated from one another and deposited in the refilled tank.

PRECAUTIONS : Rubber, metal, brass pieces and plastics are disliked by earthworms.

Salt, chilly, vinegar, soap or soapwater as well as insecticides go to destroy the earthworms hence, ought to be avoided. Be watchful of rodents, insects, birds etc. which feed on earthworms.

COST : Following this technology, 1kg earth-worms (about 200 in numbers) will multiply to about 250 kgs. The cost of 1 kg of earthworms is about 200 Rupees. Within an year the earthworms would be of about (200 x 250) = Rs. 50,000/-

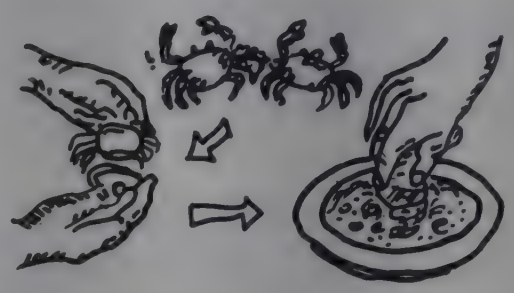
SOURCE : MADHAV RAMCHANDRA BHIDE
MORESHWAR CO-OPERATIVE HOUSING SOCIETY
BANER, AUNDH PUNE - 411 007
MAHARASHTRA

COCONUT OIL FROM CRAB

1

GRATE THE COCONUT.

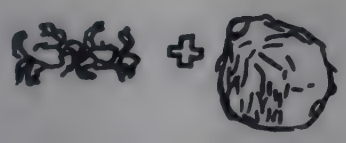
2



Take off the hard shell of river crab and grind.

3

Mix throughly the ground crabs with the grated coconut



4

Let the mixture stay overnight

5

Next morning expose it to sun.

6

Collect it & squeeze it to get the oil.

7

Put the oil in a Bottle.

TECHNOLOGY NO. 24

LOW COST COCONUT OIL EXTRACTION

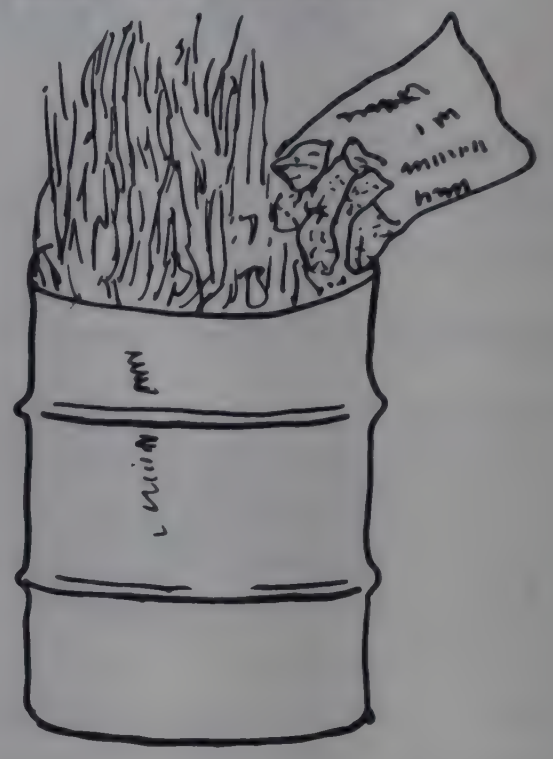
DESCRIPTION : This Crab Fermentation Technology yields much more coconut oil than the traditional one. It saves time and energy. It is pretty economical on one hand and does not ~~even~~ require any fuel, on the other.

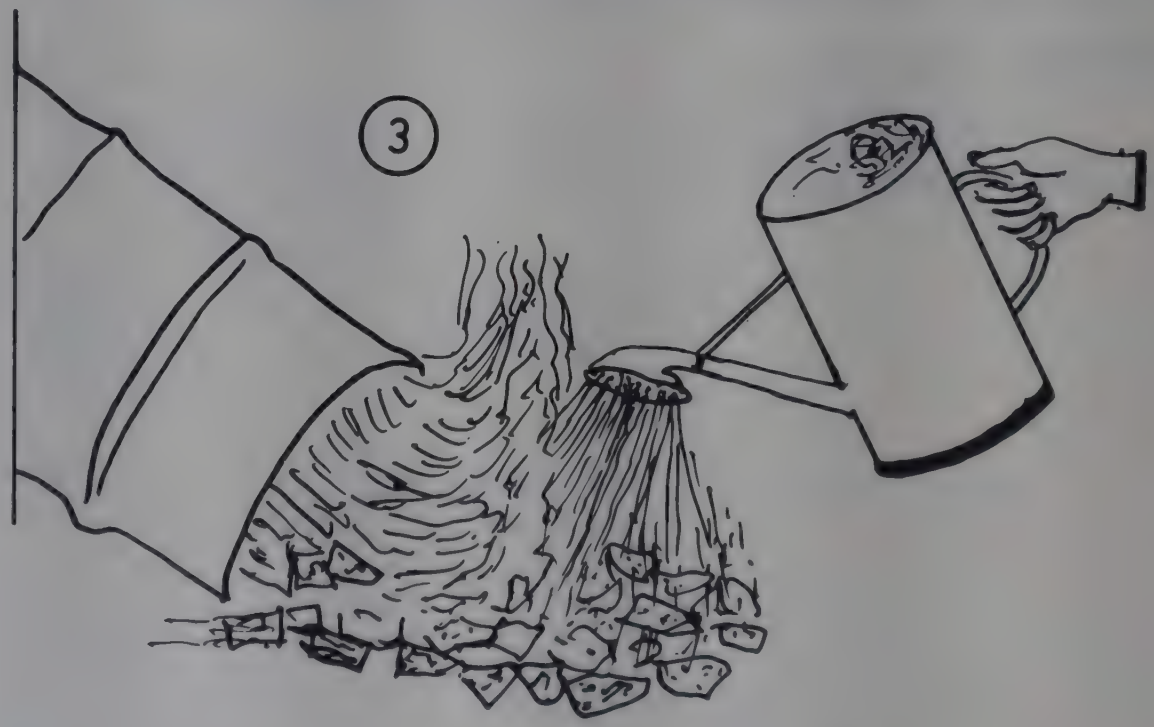
MATERIALS : A coconut grater, a bowl, a drying pan or a plastic sheet.

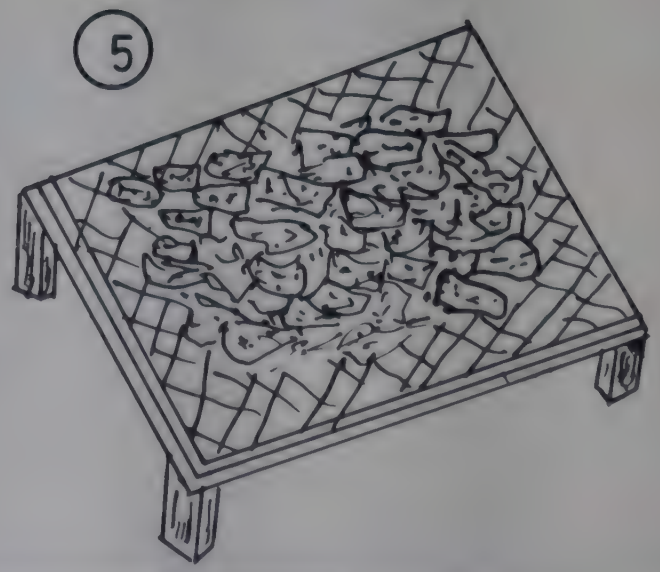
WORKING : Grate a fairly ripe coconut (figure 1). Gather some river crabs (2 crabs per coconut) as shown in Figure 2. Take off the hard shell of the crabs and grind them (see figure 3). Mix the grinded crabs thoroughly with the grated coconut (see figure 4) and keep it in a bowl, covered with a cloth to prevent contamination, and do not disturb it for 12 hours or overnight. The next morning, this mixture will be reddish and oily. Take a sheet and spread the mixture on it to expose it to the sun for 2-3 hours (see figure 5). Turn the mixture every hour so that it dries completely. Then, put the mixture in a bowl and squeeze it by hand to get the oil (see figure 6). Put the oil in bottle (see figure 7). Boil the oil with some onion in order to get a good flavour.

SOURCE : DIAN DESA,
P.O. BOX 19
YOG YAKARTA
INDONESIA

CHARCOAL FROM CORN-COB







TECHNOLOGY NO. 25

CHARCOAL FROM CORN COBS

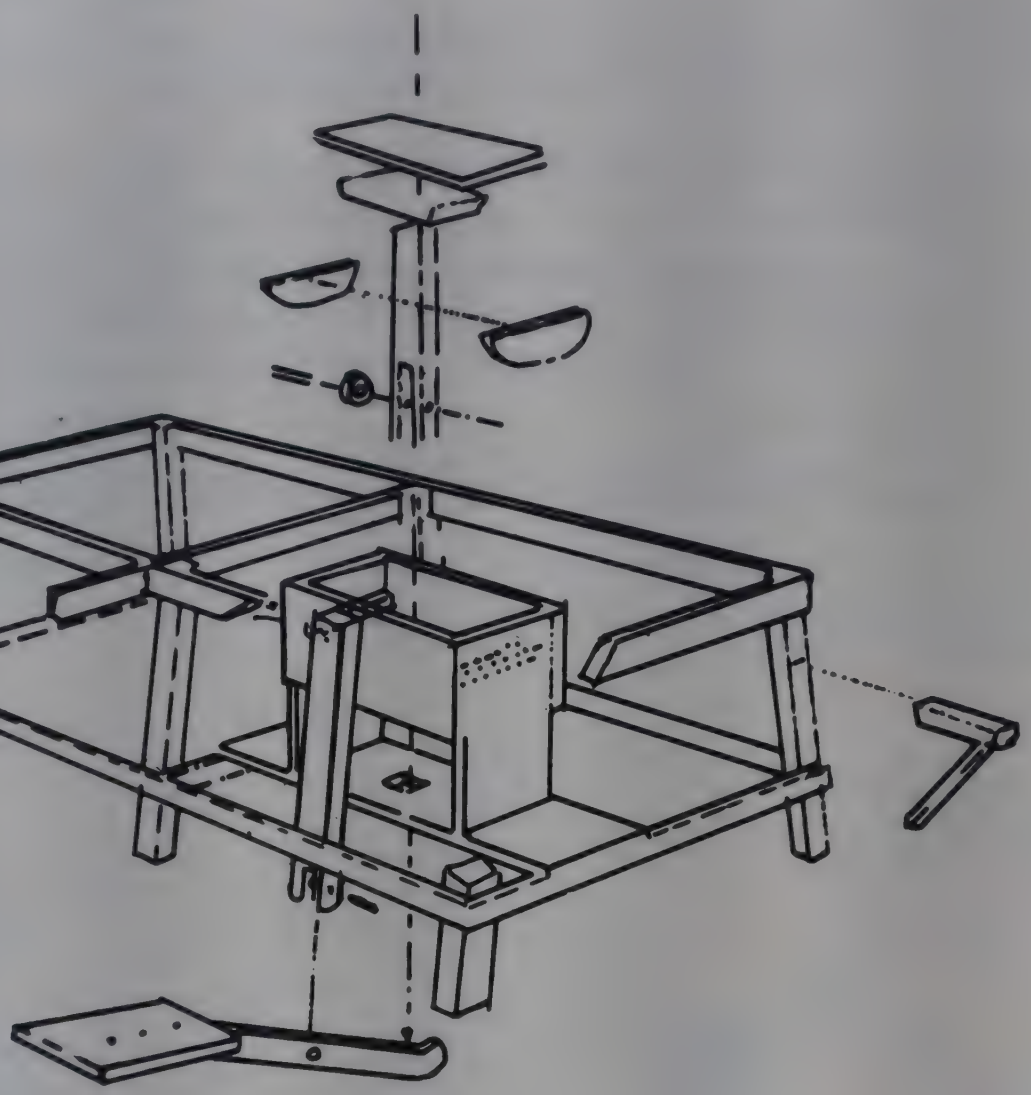
DESCRIPTION : Controlled burning of corn-cobs, agricultural waste of maize crops, provides thermally-efficient charcoal which could act as an excellent fuel in rural households.

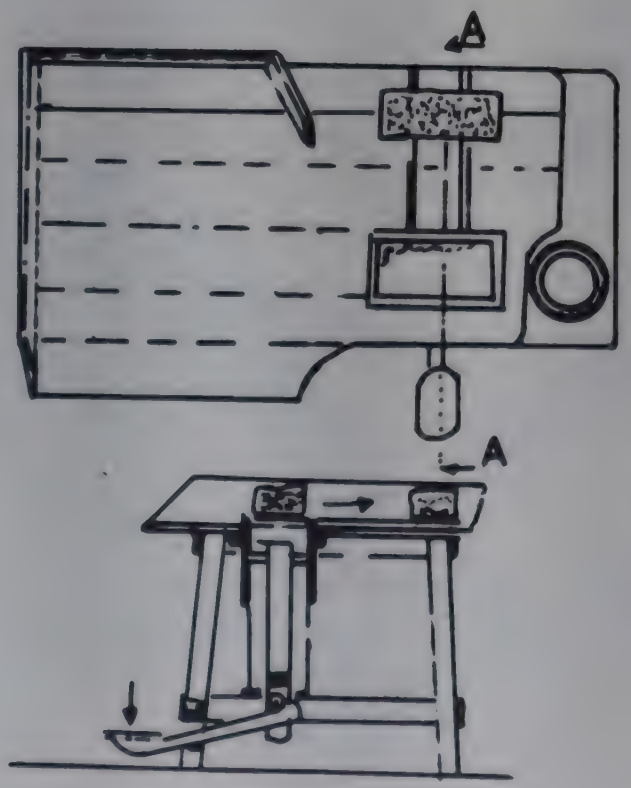
WORKING : Take a regular oil drum of 200 litre capacity with an open top. Fill one drum with one-third of the total cobs and put them on fire. Keep the cobs burning till they emit smokeless flames. Then, pour the remaining portion till the burning is completed. On completion of burning, the hot charcoal is dropped on to the floor and the fire is extinguished with water. Spread the charcoal and dry in the sun. Sieve the sub-dried charcoal, discarding smaller particles. Spare the charred cobs for utilization as fuel.

ADVANTAGE : This new, thermally-efficient, charcoal burns without producing any smoke.

SOURCE : CONSORTIUM ON RURAL TECHNOLOGY
D - 320, LAXMI NAGAR
NEW DELHI - 110092

BRICK MOULDING TABLE





TECHNOLOGY NO. 26

BRICK MOULDING TABLE

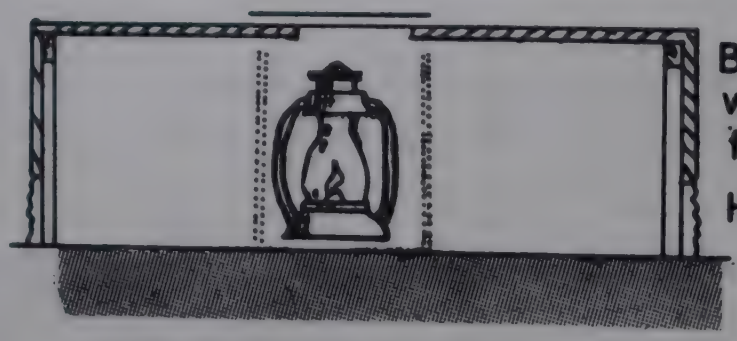
DESCRIPTION : Rural women with average skills can make about 1500 bricks per day, utilising the Brick Moulding Table. The bricks constructed with this process are uniform in size, superior in quality (to conventional bricks) and more durable.

CONSTRUCTION & WORKING : Brick moulding table is made of wood with a metallic (or wooden) mould fixed on it. There are base plates in the mould, with the lower plate attached to the ejector shaft which is pedal-operated. Well kneaded fine clay is rolled over fine sand and thrown into the mould with slight force. Surplus clay is removed by a wire bow and a wooden pallet is placed on the surface. The brick is ejected by pressing the ejector pedal down and is lifted off by holding it between the loose bottom plate and the pallet kept on top. The pedal is then released and the base plate drops to its original position. The moulded brick is turned on its side and the bottom plate is removed and returned to its original position in the mould box. The process is repeated all over again for moulding the next brick.

COST : Rs.500/- (approx.)

SOURCE : THE DIRECTOR
CENTRAL BUILDING RESEARCH INSTITUTE
ROORKEE - 247 667
U. P.

CHICK BROODER



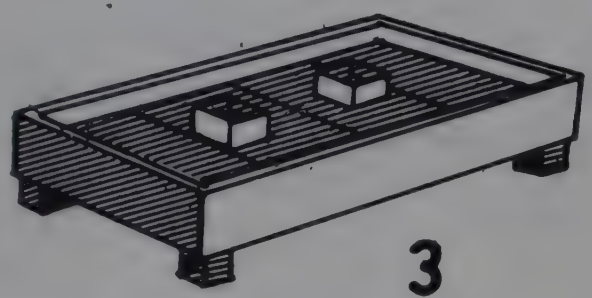
Bush or hurricane lamp placed inside wire mesh or inside perforated tin can for protection.

Hanging cloth strip will help retain heat.

2

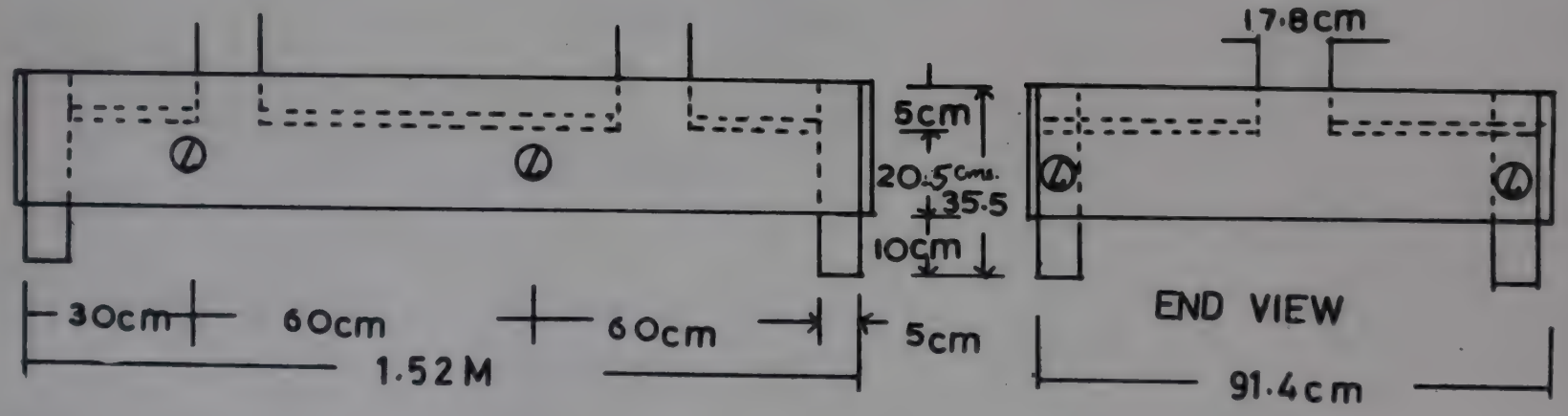
15 CM HOLE

1

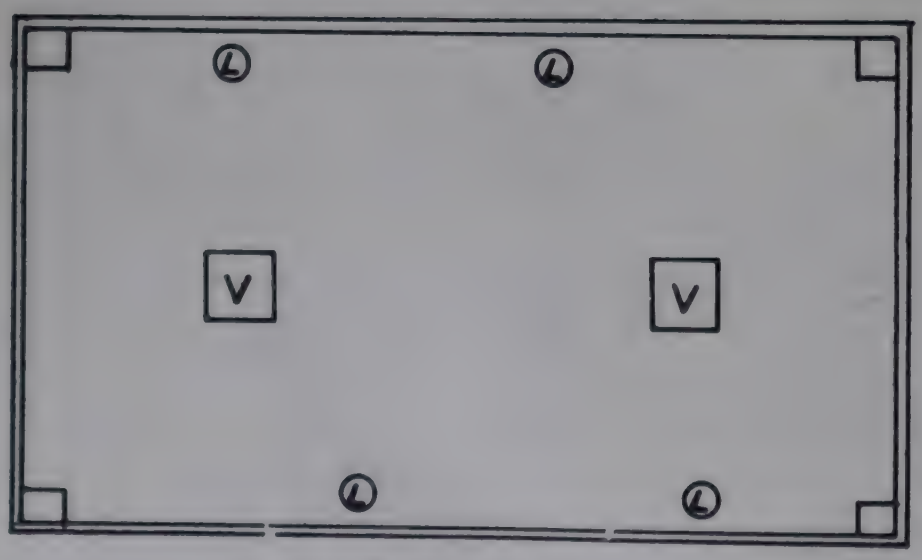


3

BROODER FOR 300 CHICKS



4



TOP VIEW

TECHNOLOGY NO. 27

CHICK BROODER

DESCRIPTION : This brooder for 300 chicks is an efficient technology to raise broilers as a cash crop and generate employment for women in the rural areas of India. It can be used either with lanterns or electric bulbs — whatever appears convenient and economical.

CONSTRUCTION : The construction details are provided in the illustration (figure 4) on the opposite page. Two brush or hurricane lamps are placed inside wiremesh or two tin cans to protect the chicks and to help radiate the heat (figure 2). A hanging cloth strip will retain the heat inside the brooder. Keep two holes of 15 cm diameter (figure 1), above the lanterns on the top for ventilation purposes. A swinging metal cover regulates the size of the opening.

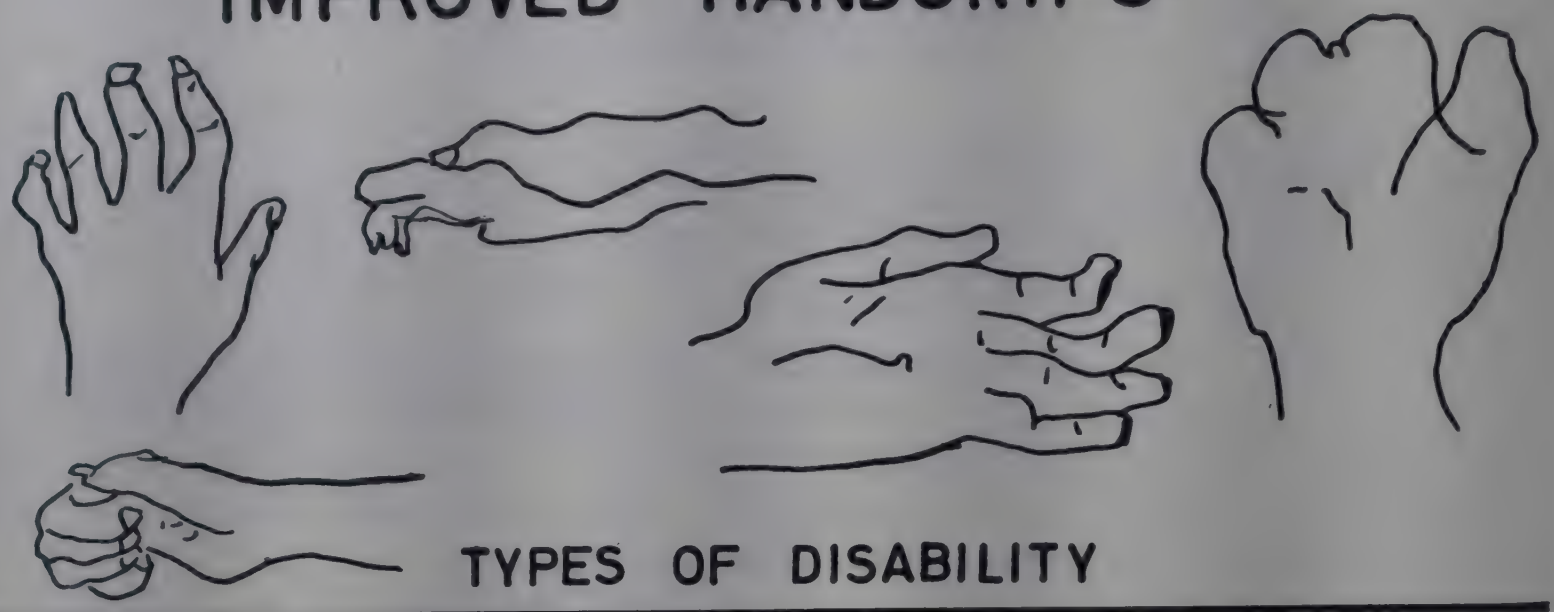
PRECAUTION : If lanterns are used, their wicks should be cleaned daily.

COST : Rs.300/- (approx.)

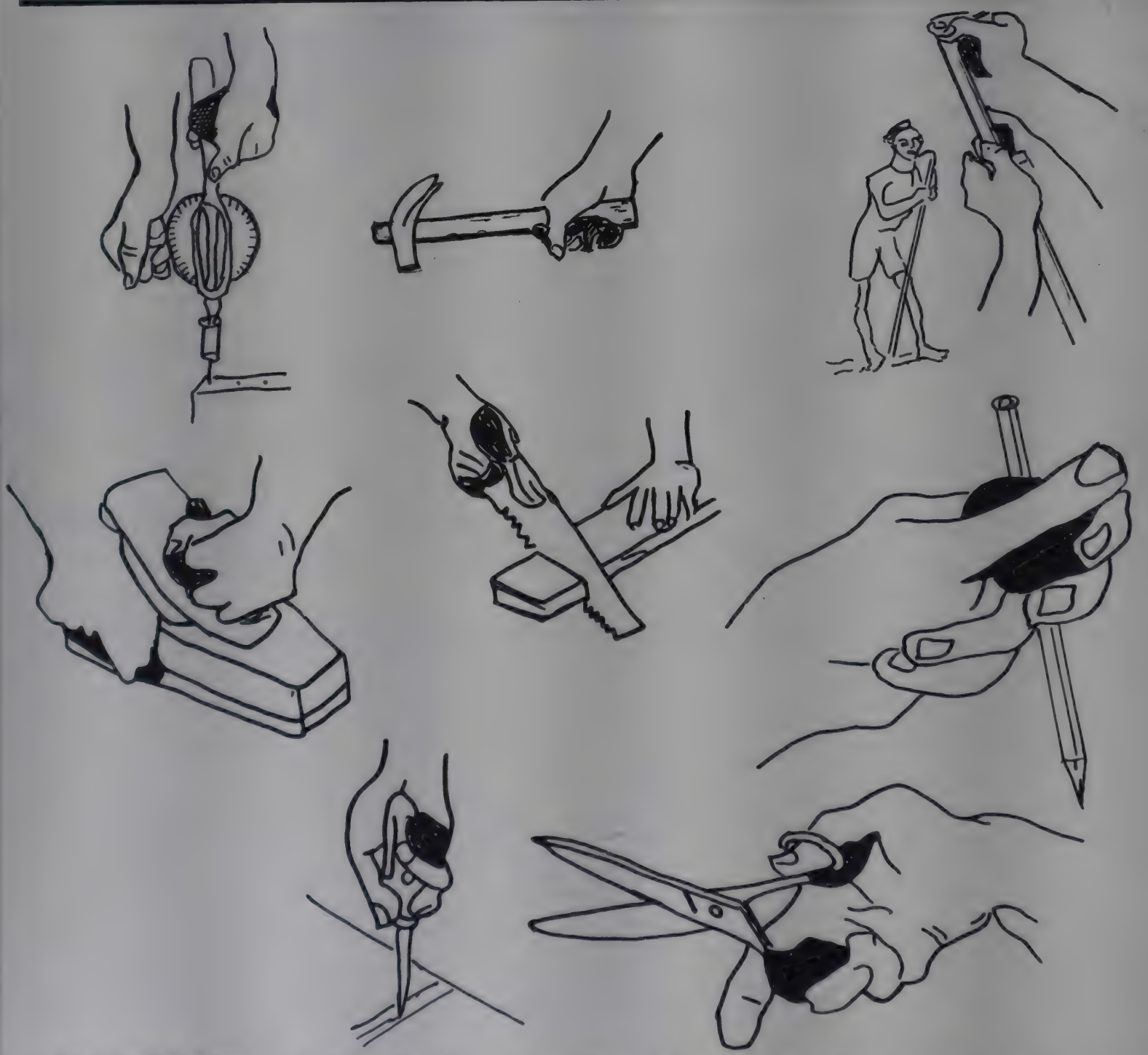
SOURCE : VOLUNTEERS IN TECHNICAL ASSISTANCE (VITA)
3706 RHODE ISLAND AVENUE
MT. RAINIER
MARYLAND, USA - 20822

WH 100
05765
COMMUNITY HEALTH CELL
LIBRARY
AND
DOCUMENTATION
UNIT

IMPROVED HANDGRIPS



TYPES OF DISABILITY



Handgrips can help a disabled person hold things

TECHNOLOGY NO. 28

IMPROVED HAND GRIPS

DESCRIPTION : Handgrips for handicapped women go a long way in helping them carry out normal day-to-day functions. Various types of hand grips could be constructed out of plaster of paris. These handgrips are not only drudgery-reducing in nature but also lowcost. A broad spectrum of hand grips is displayed in the illustrations, pertaining to numerous activities, on the opposite page.

Such improved handgrips boost up the morale of the handicapped women who, otherwise, feel alienated from the mainstream of the society.

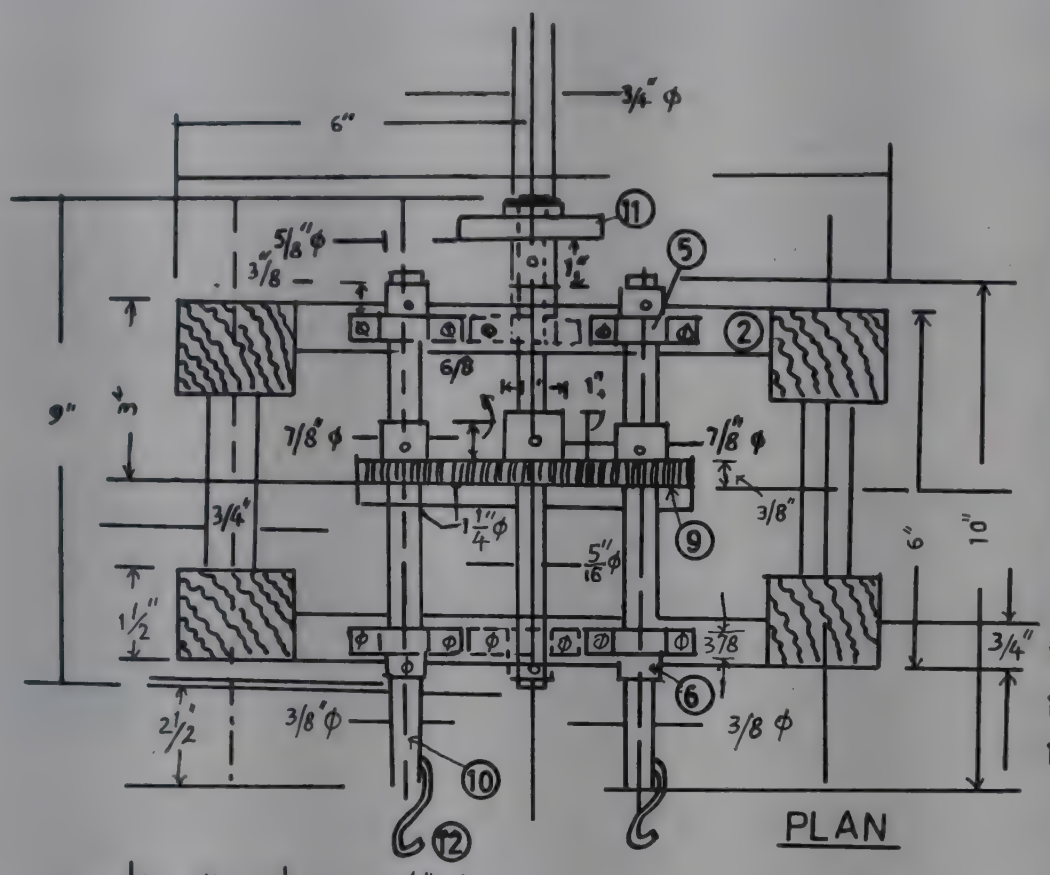
MATERIAL : Hand grips can be made of Clay (modelling clay or clay from the ground) Plaster (modelling plaster or plaster used for building). Clay and plaster (Modelling plaster) can be mixed with short fibres or chopped up pieces of string to make them stronger. Epoxy resin putty (there are several brands available) is the strongest material and can be immersed in water. Always follow the manufacturer's instructions.

CONSTRUCTION : Take a small piece of the material and make it into a ball. Put it in the hand of the disabled person. Put the item on which the grip is to be fixed into the material in hand. With items such as pencils and forks push the end of the item through the material. Do not wrap it around the item. Make the person hold the item in the way she would normally use it. Press the person's fingers firmly in position so that a clear impression is made. Leave the grip in place for a few minutes. Then take the item with the grip out of hand and let it harden.

PRECAUTION : If the grip is made of clay, bake it in the sun. Cover with oil or grease to make it more resistant to water. Do not immerse the grip in water if you are washing the item.

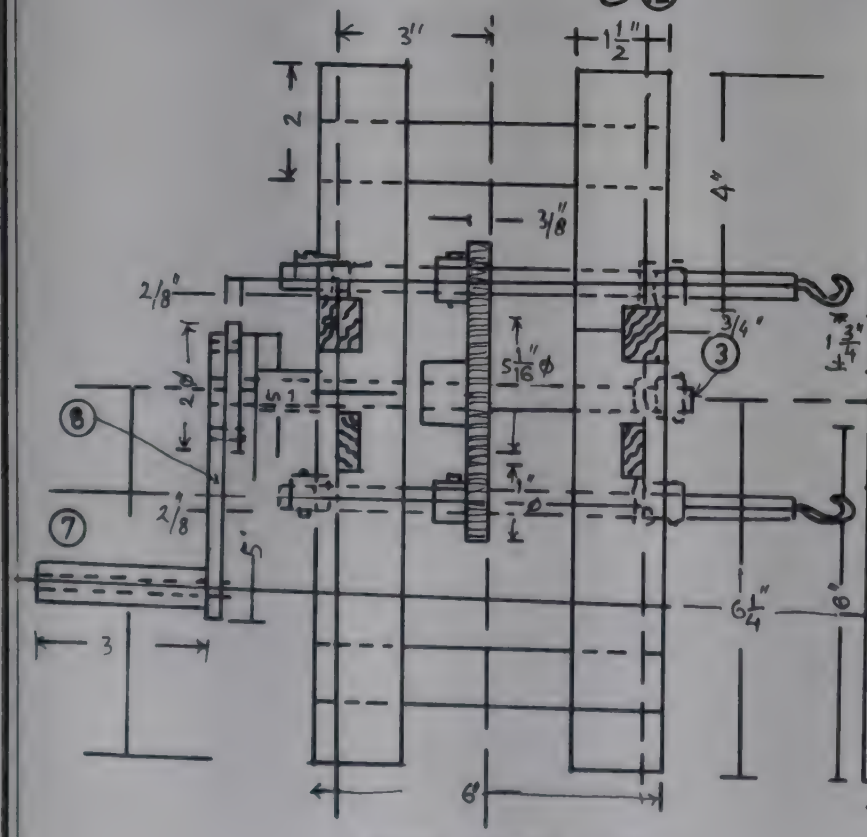
SOURCE : AHRTAG
1 LONDON BRIDGE STREET,
LONDON, SE 19 SG
U.K..

ROPE MAKING MACHINE

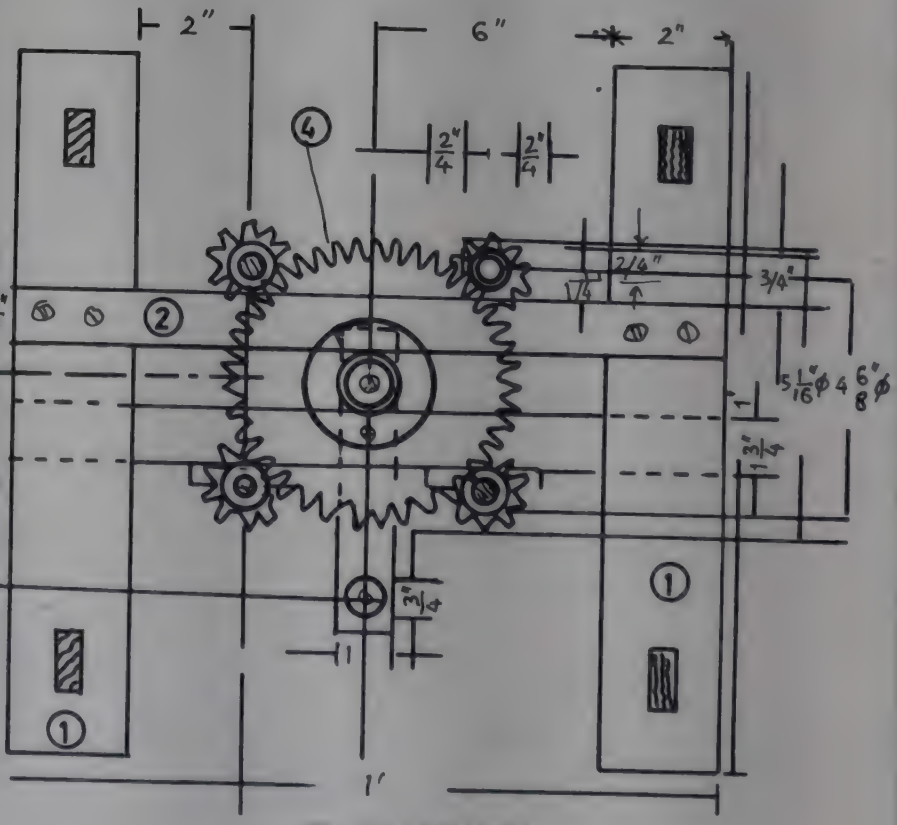


PLAN

1. LEG
2. FRAME
3. CRANK SHAFT
4. DRIVER WHEEL (SPUR GEAR 46 TEETH)
5. BUSH BEARING
6. COLLAR WITH PIN BALL BUSH
7. HANDLE
8. CRANK
9. PINION WHEEL (SPUR GEAR 10 TEETH)
10. SPINDLE
11. FLANGE (FIXED WHEEL)
12. HOOK



LEFT SIDE VIEW



ELEVATION

TECHNOLOGY NO. 29

ROPE MAKING MACHINE

DESCRIPTION : This handy rope making machine is extremely simple and can be easily made with locally available materials and skills. It enhances the production rate of ropes utilized in construction of fishing nets, carpets, etc. It has very nominal maintenance cost.

CONSTRUCTION : The main constituent parts of the rope making machine are described below (see sketch)

1. Four wooden legs and stands: Each of size 30.5 x 5 x 3.8 cm. These legs are joined together with wooden railings are rafts in the middle and end parts of the stands. The railings are fitted into the legs/stands in square shaped holes with ball rush screws, nails etc.

2. Four Wooden Railings: They are not removable and each has a sise of 30 x 4 x 2 cm. Wheels and appliances are fitted into them.

3. Main Wheel Shaft: The shaft is made of mild steel and is fitted at the centres of the wheels. Its size is 23 x 1 cm and has 5 holes for fitting or fastening with screws.

4. Aluminium Gear Wheel: It has 56 teeth and a hub at the centre. It's size is 15 x 1 cm and the wheel teeth measure 1 cm.

5. Ten bush Housings: They are made of iron and have a size of 50 x 1 x 3 cm. They help in fixing the wheels intact.

6. Ten Bushes: They are made of Aluminium in the size of 1 x 2 cm and have holes of 3 cm to 1 cm for screws, nails etc.

7. Fly wheel: It is 5 cm in diameter and 4 mm thick with a round-shaped tip of 2 cm x 3 mm.

8 & 9. Handle: It is a wooden handle with a mild steel bar of 4 mm inside diameter fitted into the shaft. It can be revolved by hand - both clockwise and anti-clockwise.

10. Four Spindles: They are made of mild steel in the size of 25.4 x 1 cm and are provided with 5 hooks to be fitted into 5 holes with screws /nails.

11. Pinion: Made of aluminium, it has 10 teeth and has a size of 3 x 1 cm. It sets the spindle in motion.

WORKING : To initiate the rope making, two rows or threads of 6 counts are woven or spun around a bobbin. Thus 8 bobbins with threads are fitted or hung against a yarn hanger. Then, the threads are laid straight, put together and rolled on to a big bobbin. The tip of the threads is drawn out to a distance of 20 metres where it is placed around a hook of the yarn hanger and let out again to be fastened on to a spindle of the machine.

The action is repeated in respect of the second spindle and the extra thread cut off. The entire operation is then repeated for third and fourth spindle.

In the whole operation, there is twice fastening and cutting of the threads laid out straight and four times the binding before twisting of threads is started by working at the handle. Then the handle is rotated in a clockwise direction 72 times to produce a 2 cm thick rope. Twisting of four threads of 2 cm thickness results in a 4 cm thick rope - This is achieved by rotating the handle in anti-clockwise direction 120 times.

ADVANTAGE : This improved rope-making machine increases the output manifold, compared to that of hand winding.

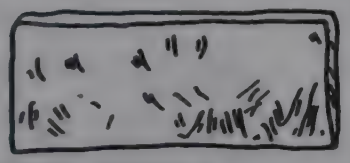
COST : About Rs.250/- a unit, if produced on a large scale.

SOURCE :

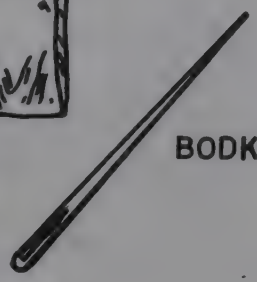
1. R.K. SHRIDAM SINGH
   SUPERINTENDENT
   GOVERNMENT BASIC TRAINING INSTT
   IMPHAL, MANIPUR

2. N.R.D.C.
   20-22 ZAMROODPUR COMMUNITY CENTRE
   KAILASH EXTENSION
   NEW DELHI - 110 048

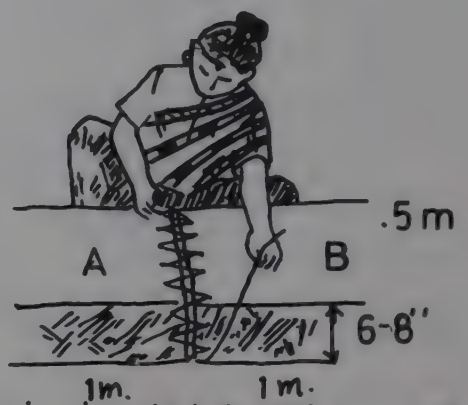
THERMOCOL KATTUMARAM



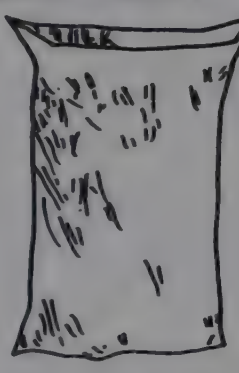
THERMOCOL SHEET



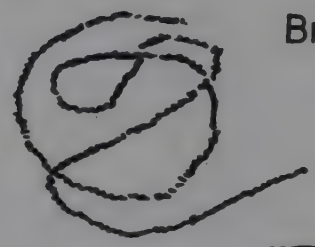
BODKIN



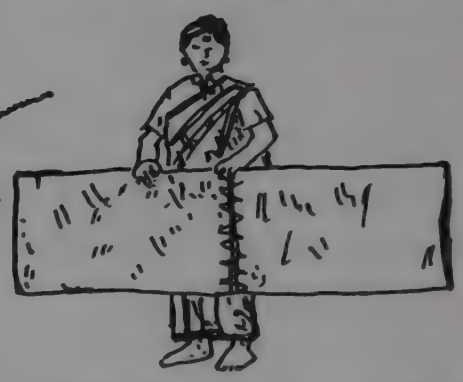
Bringing 'A' & 'B' closer & stitching.



BAG



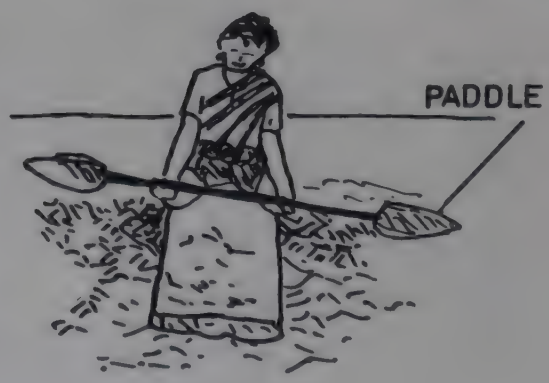
PLASTIC ROPE



Completed thermocol Kattumaram.

Thin thermocol sheets placed one over another.

Thermocol sheets inserted into bags and stitched



TECHNOLOGY NO. 30

THERMOCOL KATTUMARAM

DESCRIPTION : Thermocol kattumaram is a polystyrene foam fishing boat which is an improved version of traditional wooden fishing boats. It is a light, cheap, durable and simple to make boat.

MATERIALS : Empty chemical fertilizer bags or gunny sacks, plastic rope and a bodkin.

CONSTRUCTION : Two, one metre long by half metre wide and 6 to 8 inch thick thermocol sheets are inserted separately into two used synthetic or gunny sacks. The mouths of the sacks are arranged side by side and stitched together with plastic rope using a thick bodkin. (This easy construction is illustrated on the opposite page). It is rowed with the help of a 6 feet long double-paddle.

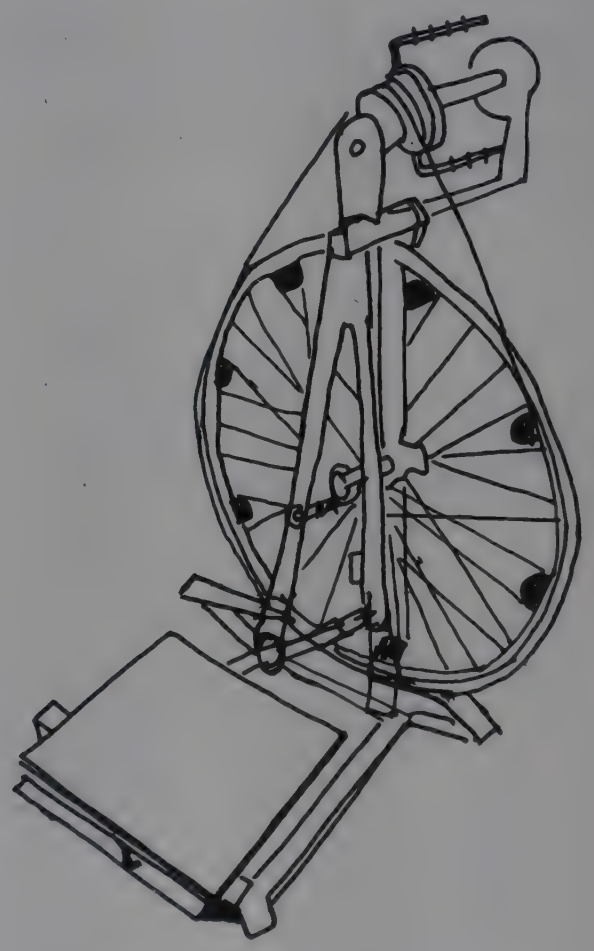
ADVANTAGES : 1. This new boat weighs 10 Kgs and hence, is easily portable on head, by hand or on a bicyle. 2. It can carry one fisherwoman, 20 Kgs of nets and, of course, the fish catch. 3. It's maintenance requires only changing the bags thrice a year.

COST : Rs.350/- (approx.)

SOURCE : CAPART
D-56 PANKHA ROAD
JANAK PURI
NEW DELHI - 110058

WOOL SPINNING

CHARKHA



TECHNOLOGY NO. 31

WOOL SPINNING CHARKHA

DESCRIPTION : This charkha is made from mild steel and driven by a bicyle wheel. All parts are readily available anywhere in India. The Medleri Charkha combines versatility with ease of operation and is appropriate for village conditions. It produces a better quality yarn, even from poor quality wool, than the hand operated charkha.

ADVANTAGES :

- Foot operated, with self-winding mechanism.
- Easy to maintain.
- All parts locally available in any market.
- Capacity at least 200 gms. per hour of 3 count yarn.
- Easily spinning 5 to 6 count yarn.
- Produces strong, even yarn for better, longer lasting products.
- No mechanised pre-spinning processing of wool is necessary.
- Will spin any quality of wool.

COST : Rs.250/-

SOURCE : INDIA DEVELOPMENT SERVICE
MEDLERI - 581 211
DHARWAD DISTRICT
KARNATAKA

II.

DRUDGERY REDUCING TECHNOLOGIES

- Drawing & Fetching Water
- Cooking
- Repair & Maintenance of House
- Working on Farm & its Products

TECHNOLOGY NO. 32

BUCKET PUMP

DESCRIPTION : This new technology is basically utilization of a bore hole by raising water, through this bucket pump, from a shallow depth of 15 metres or so.

MATERIALS : Wooden posts, Plastic casing, chain, lid, hand-crank, washer, disc, sheet metal, bolt, pvc tube and a piece of steel.

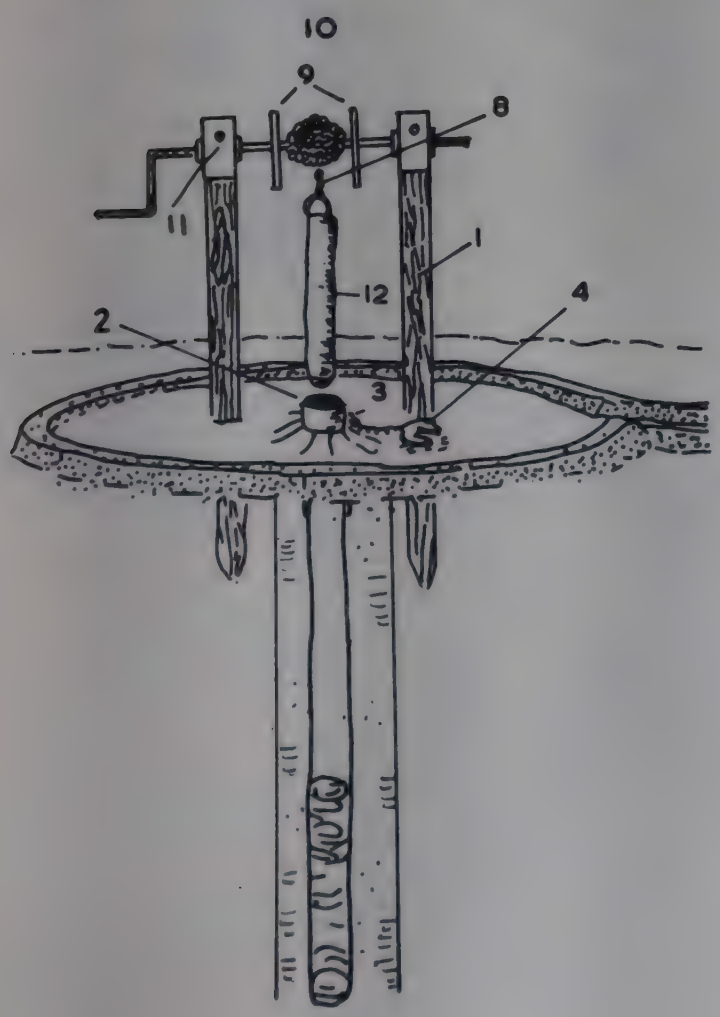
CONSTRUCTION : Sink two wooden posts, one each to the left and right-hand sides, respectively, of the bore hole to a depth of about one metre. Fit a 2 cm long pipe or sleeve over the plastic casing of the PVC pipe above the ground. Once this casing is sealed, the sleeve provides protection to the plastic bore pipe from damage. Fit the sleeve in such a manner that it is just out about 10 cms above the concretised ground. Now, attach a chain with a lid to the sleeve for inhibiting the entry of any untoward substance. Make a slit inthe lid in order to close the well with the bucket and chain inside the casing, after drawing the water. Make a hand-crank arrangement between the two posts, secured with 4 metre washers. Slip a U-shaped piece of sheet metal over the tops of each post and secure them with 10 mm bolts and nuts.

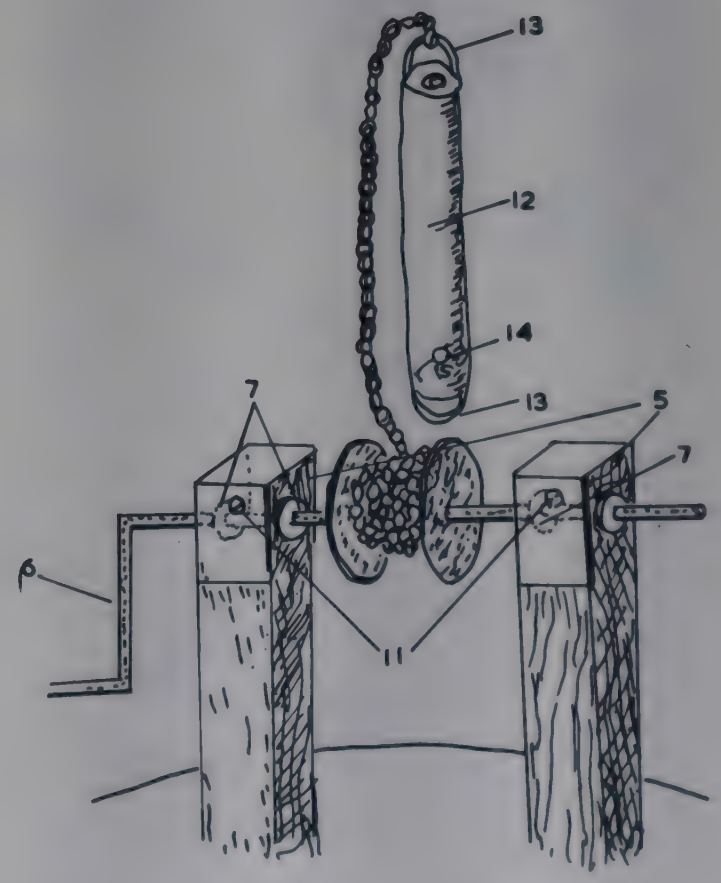
To construct the bucket, take a 10 cm diameter PVC tube which is 65 cms long and secure its top and bottom openings with bow-shaped pieces of steel. Connect a chain to the top-hook of the bucket and wind the chain inthe centre of the hand-crank and contain its winding between the two discs, placed 30 cms apart. Fit a rubber flap above the hole at the base of the bucket.

WORKING : The rubber flap at the base of the bucket-chain pump acts as a one-way valve. When the bucket is lowered into the water, the air is pushed out of the bucket and water rushes up the valve to fill up the vacuum. On lifting the bucket the valve gets closed and the water column at its top gushes up and out of the well. It is as simple as that.

COST : Rs.500/- (approx.)

SOURCE : GATE, DAG-HAMMARSKJOLD - WEG 1
D-6236 ESCHBORN 1, FEDERAL REPUBLIC OF GERMANY

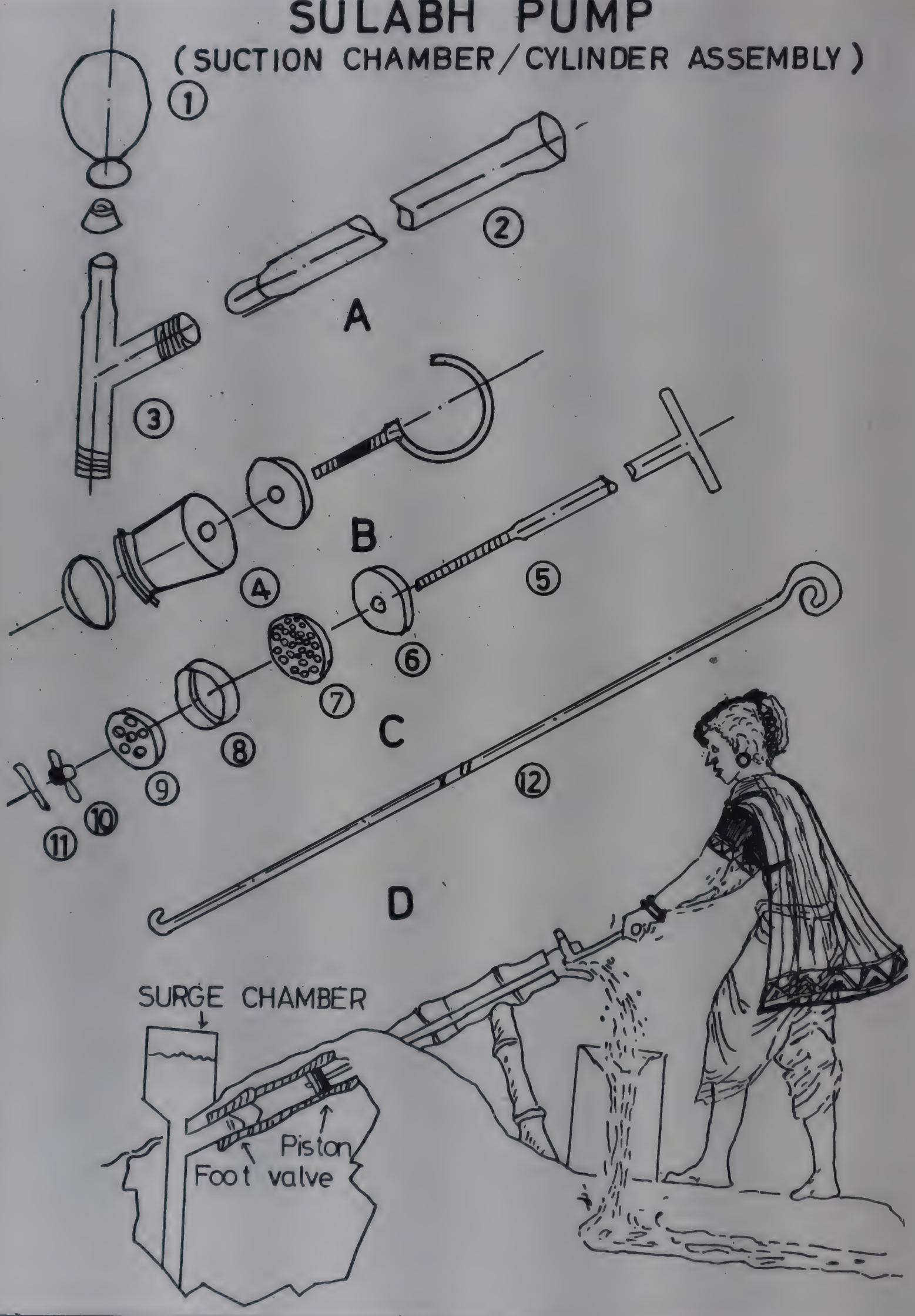




1 Post, 2 Casting, 3+8 Chain,
4 Lid, 5 Slot, 6 Hand-crank,
7 Washer, 9 Disc, 10 Sheet metal,
11 Bolt, 12 Bucket, 13 Steel hook.

SULABH PUMP

(SUCTION CHAMBER/CYLINDER ASSEMBLY)



TECHNOLOGY NO 33

SULABH PUMP

DESCRIPTION : Sulabh Pump is an ideal device to draw water from shallow depths. It reduces drudgery of the rural women and saves their time.

CONSTRUCTION : It is basically a simple water-pump based on the one-way valve system. It comprises of (1) a surge chamber (an aluminium pot), (2) a cylinder (3) a 'Y' shaped pipe, (4) a foot-valve assembly, (5) a broken handle, (6) a delivery tube, (7) a strainer, (8) a leather washer, (9) an aluminium support, (10) a flymus, (11) a cotter pin and (12) a hook rod. (See Figures A, B, C & D).

WORKING : This manually operated pump can be operated by a young woman or a young boy in a sitting or standing posture. It can function up to the depth of 6.5 metres and discharges 30 to 40 litres per minute, on an average. The pump is raised to a higher elevation from the water source and rested on 2 bamboo stands to which it is firmly secured. Care must be taken to keep the suction pipe as clean as possible.

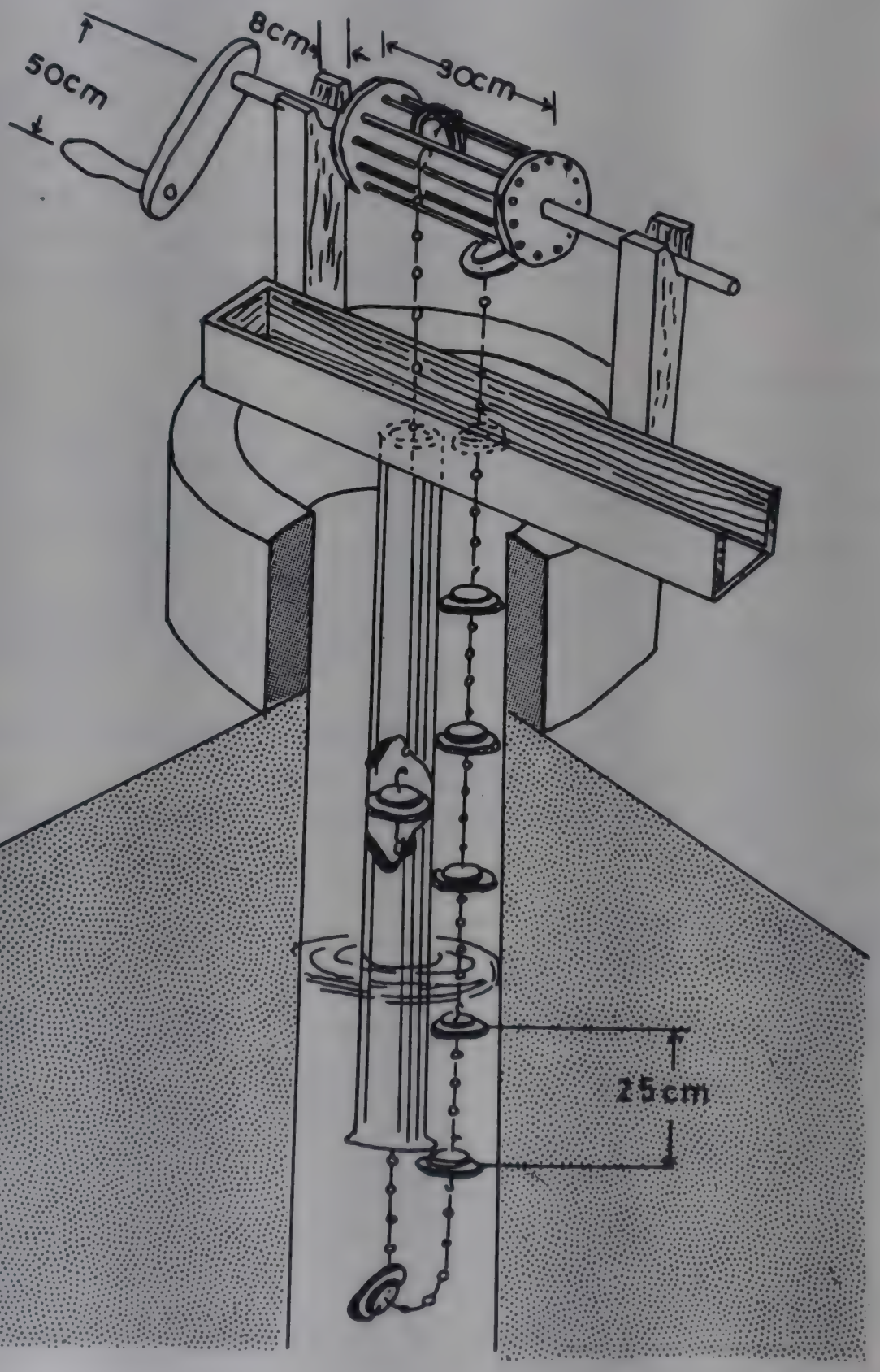
INSTALLATION INSTRUCTION :

— Improper installation may lead to incomplete lifting of water and enhancement of drudgery of human labour. It might even culminate into non-functioning of the pump. Hence the following instructions must be followed strictly for smooth functioning of the pump:
— The pump must be placed at a level higher than the level of the water source.
— Embedding the pump in the ground would prevent theft.
— If the pump is installed above the ground, take two 'Y' shaped bamboo pieces and tie them to the pump so that it rests on the two pieces making a 30 degree angle from the ground. This make the operation very smooth.
— Leaking of the pump could be eliminated by painting the threading of the pipe
— Suction pipe should also be kept vertical, as far as possible
— Tie a mesh to the end of the motion pipe to prevent the entry of any foreign material

COST : Rs.500/- (approx.)

SOURCE : OREDA, 624 SAHID NAGAR,
BHUBNANESWAR - 751 007
ORISSA

CHAIN PUMP



TECHNOLOGY NO. 34

CHAIN PUMP

DESCRIPTION : The chain pump is a manually operated shallow pump for irrigation purposes. It could draw water from a depth of about 20 feet or 6 metres.

CONSTRUCTION : As per diagram, the pump has a vertical hollow pipe with a 10 cm outside diameter. A Chain with links about 8 mm in diameter passes through the pipe. These links are basically rubber or leather washers with an outside diameter of about two thicknesses of a washer larger than the inside diameter of the pipe. These washers are placed at a distance of about 25 cms from each other, successively.

There is a crank and handle arrangement made at the top of the well. The pipe is supported by threading or welding a flange to its upper end. The pipe passes through a hole in the bottom of the wooden trough (which acts as a water-anchor to the well) and hangs into the well.

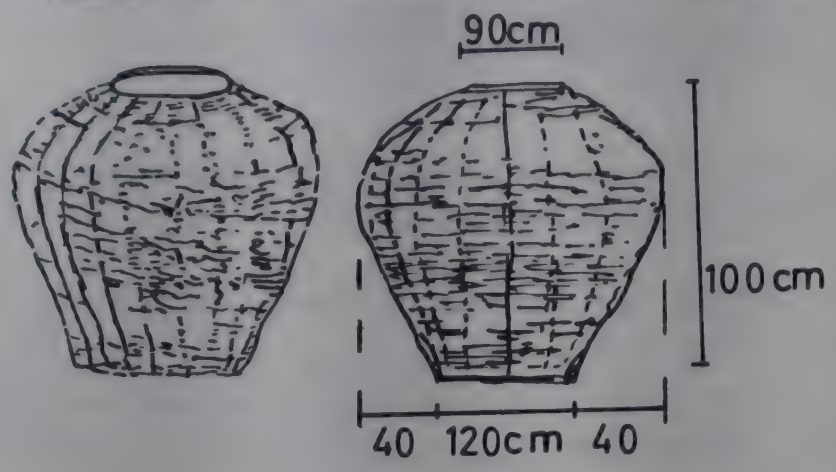
WORKING : When the handle is rotated in a clock-wise manner, the washers rise up and push the air out of the pipe. This creates a vacuum which is filled by the water rushing up the pipe. With the next rotation, the water column over the one way valve is pushed up into the trough and gushes out of the well.

ADVANTAGE : The chain pump draws 11 cubic metres (or 2906 gallons) of water per hour from a depth of 6 metres or 18 ft, 20 cubic metres per hour from a depth of 3 metres, and 25-30 cubic metres/hour upto a depth of 2 metres.

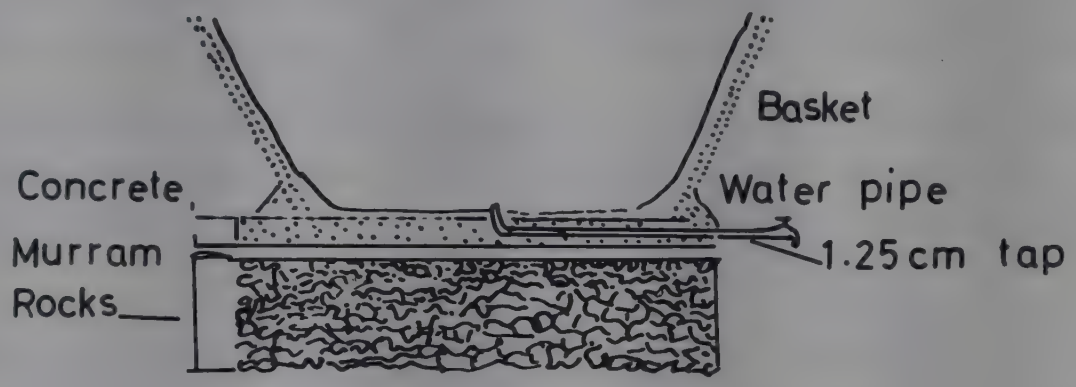
COST : Rs.500/- approx.

SOURCE : VOLUNTEERS IN TECHNICAL
ASSISTANCE (VITA)
3706 RHODE ISLAND AVENUE
MT. RAINIER
MARYLAND, USA 20822

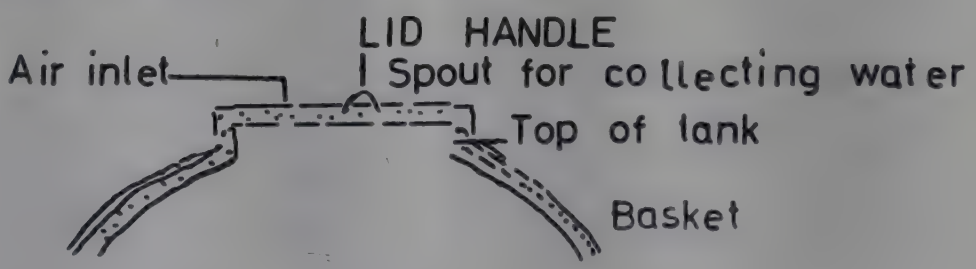
GALLANT GALA TANK



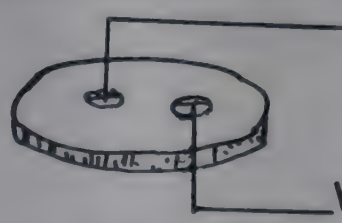
1. Gala basket constructed without a base



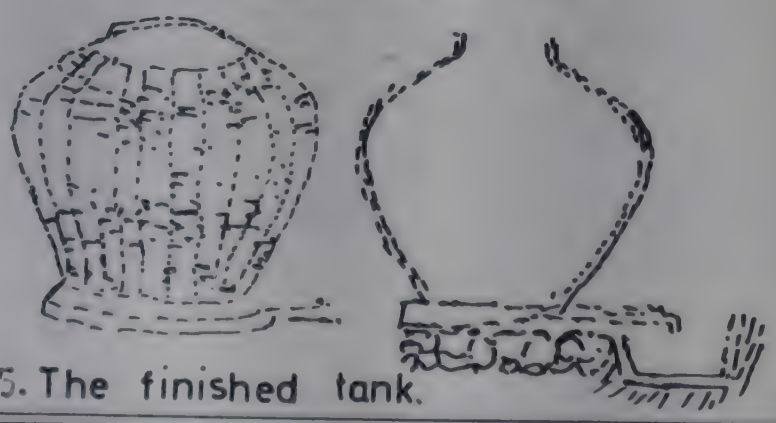
2. Construction of the foundation & positioning of the basket.



3. Construction of the lid



4. Detail of the lid.



5. The finished tank.

TECHNOLOGY NO. 35

GALLANT GALA TANK

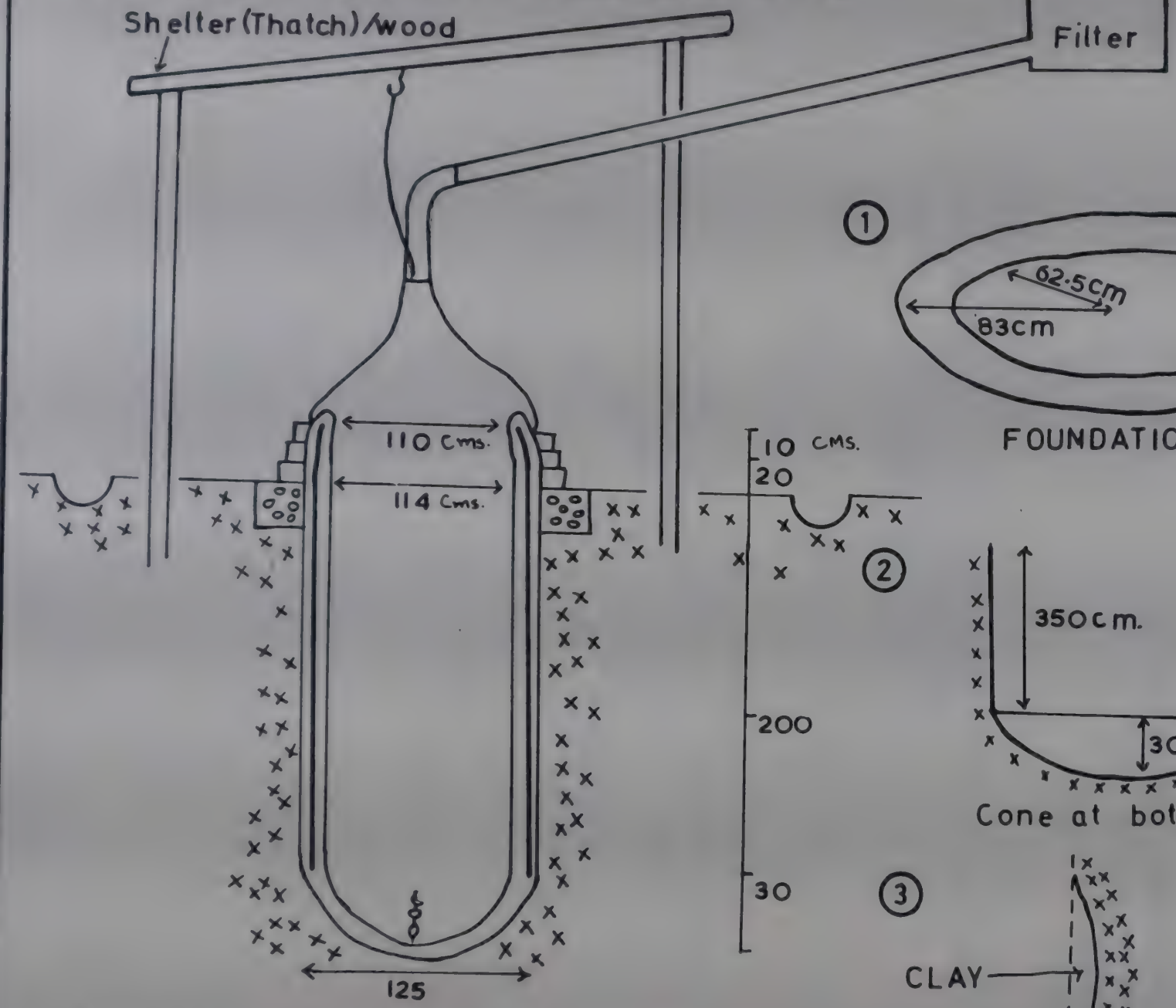
DESCRIPTION : Gala means granary basket. So the Gallant Gala Tank is a long-term water storage tank constructed by modifying a bamboo basket and plastering it, inside out, with a 2:1 sand/cement mixture. It is a boon to the rural women who have to travel long distances to fetch miniscule amount of water.

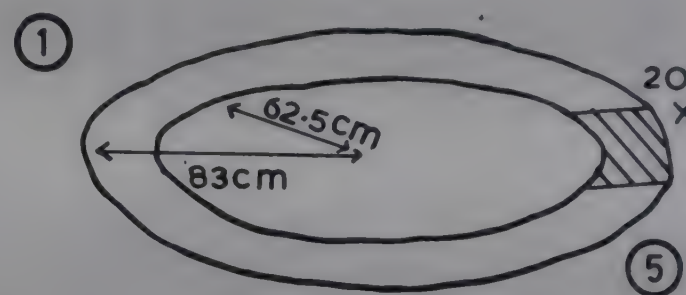
CONSTRUCTION : Gala basket is constructed on a concrete base. The construction of gala tank is pretty simple as shown in the illustrations.

COST : Rs.100/-

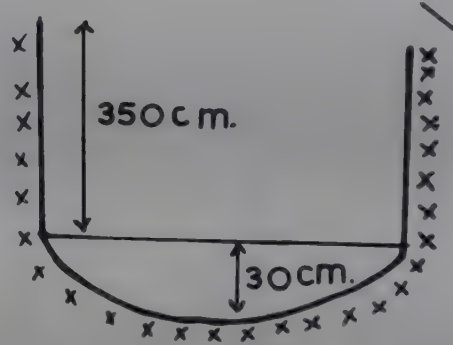
SOURCE : UNICEF
EASTERN AFRICA REGIONAL OFFICE
P.O. BOX NO.44145
NAIROBI
KENYA

FAMILY WATER RESERVOIR

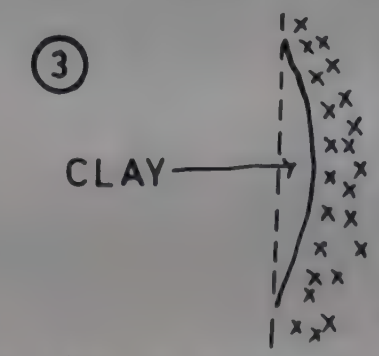




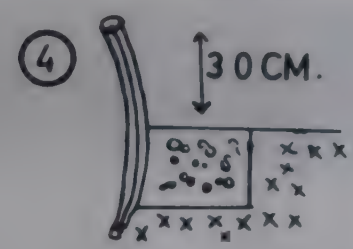
FOUNDATION



Cone at bottom

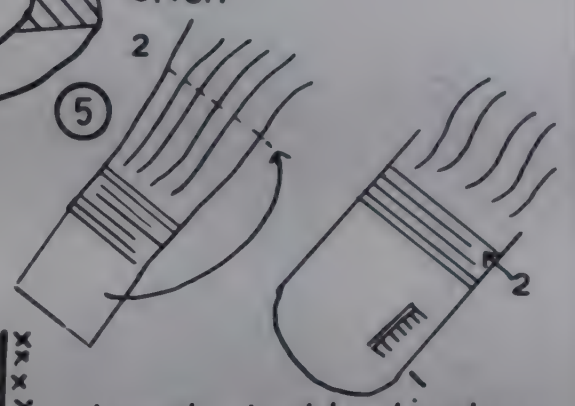


Apply clay to make the surface smooth

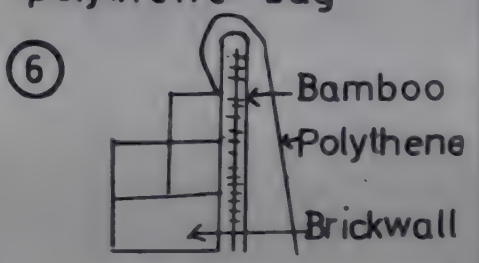


Bamboo tube

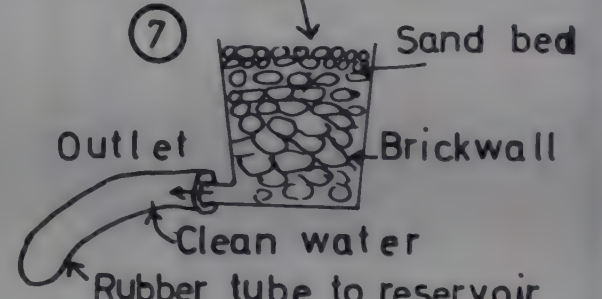
20·5Cmx 20Cm.
X20 cm.
ditch



Invert double ligature polythene bag



Rain water



Diameter (inside)	Polythene bag	114 cm
	Bamboo	118 cm
	Hole	125 cm

TECHNOLOGY NO. 36

FAMILY WATER RESERVOIR

DESCRIPTION: Shortage of water for drinking or household usage is one of the biggest problems faced by rural women. They have to trek for miles together for a little bucketful of water. This rainwater collection system uses polythene, which may be replaced by bamboo. It collects about 4000 litres of rainwater.

MATERIALS: For a 4000 litre family water reservoir you require half bag cement, a six metre polythene pipe (with 1.18 cm diameter), 100 bricks, 50 litres of water, 1/2 cubic metre of sand and polythene bag of 114 cm diameter.

CONSTRUCTION: To construct the foundations, draw two concentric circles of 62.5 cm and 83 cm radius, respectively. Dig a ditch of 20 cm depth with a 20 cm width between the circles and fill upthe pit with concrete (1:2:4) (see fig 1). When the concrete gets dry in 2 days then dig a hole vertically to attain 3.5 metre depth from the foundation and 30 cm at the bottom to make a cone. (see figure 2).

If the surface is uneven, apply some clay to attain a regular surface (see figure 3). Slide a bamboo tube up to a depth of 30 cm, on which has to pass the foundation, and narrow the bamboo to 110 cm of diameter. (see figure 4).

Apply clay if there are large gaps between the soil and bamboo. Cover the bamboo with clay to have a regular surface and apply mud on the inner surface of the cone. Build a little circular wall (20 cm high) with bricks.

Take a double-ligature polythene bag and insert it to have the ligature inside (see figure 5). Slide the bag in the hole. Put 30 to 40 litres of water to be sure that the bag is at the bottom. Cut the polythene at 15 cms over the top of the bamboo and fold it over the bamboo. Avoid making holes in the polythene.

Fix polythene to bamboo by increasing the height of the brick wall. Place the polythene sheet in the form of a cap over the polythene-covered-bamboo (see figure 6).

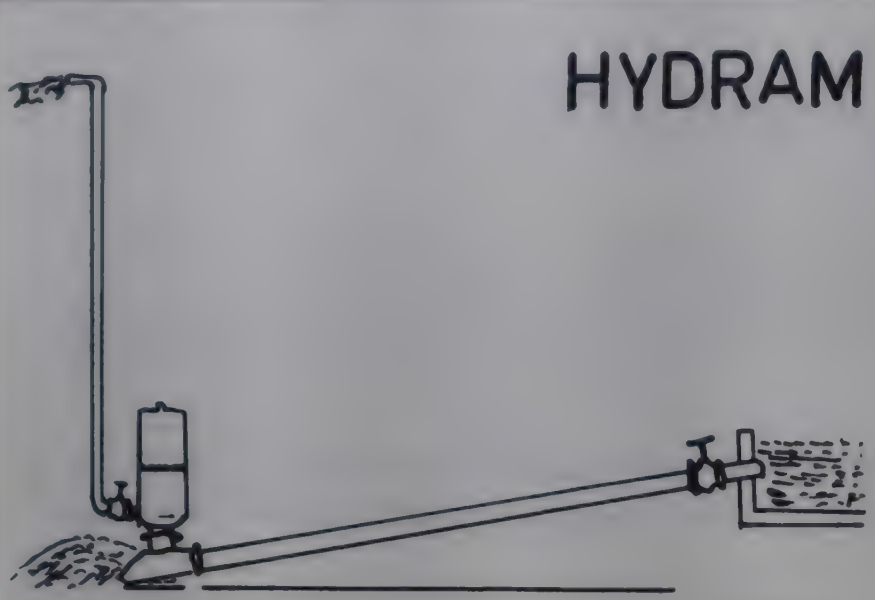
Tie the plastic cap to the thatch by means of a nylon cord. (The thatch serves as a protection to the polythene from excess heat and other damages. (see the main diagram).

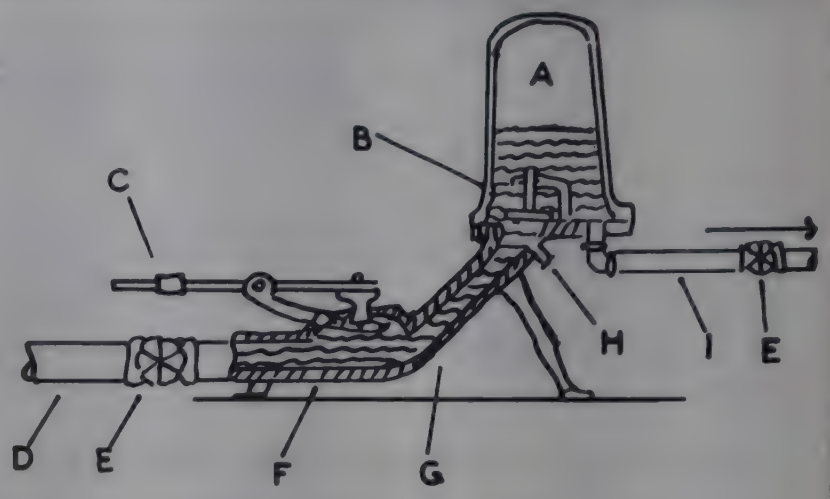
PRECAUTION : Avoid collecting the first rainy showers as they may contain the mud collected over the roof.

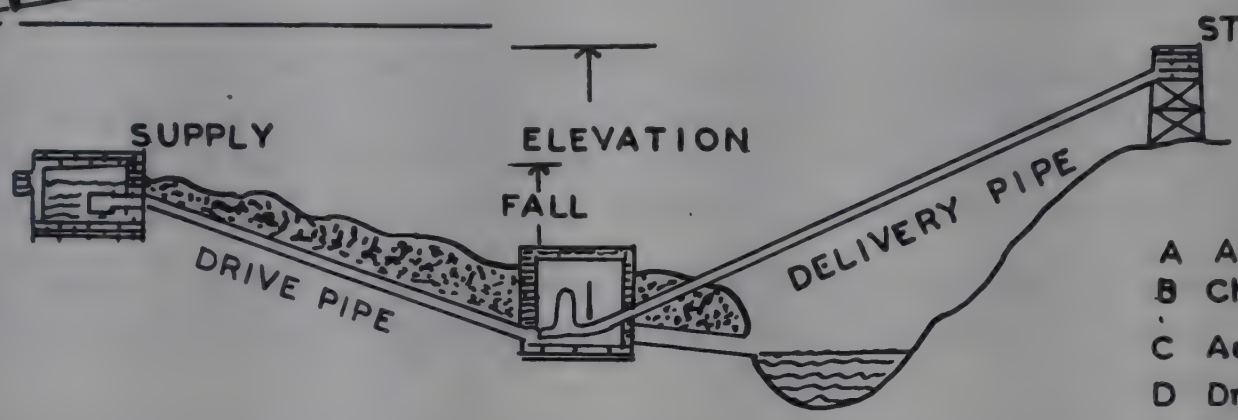
COST : Rs.300 to 400/-

SOURCE : CENTRE OF SCIENCE FOR VILLAGES
MAGAN SANGRAHALAYA
WARDHA - 442 001
MAHARASHTRA

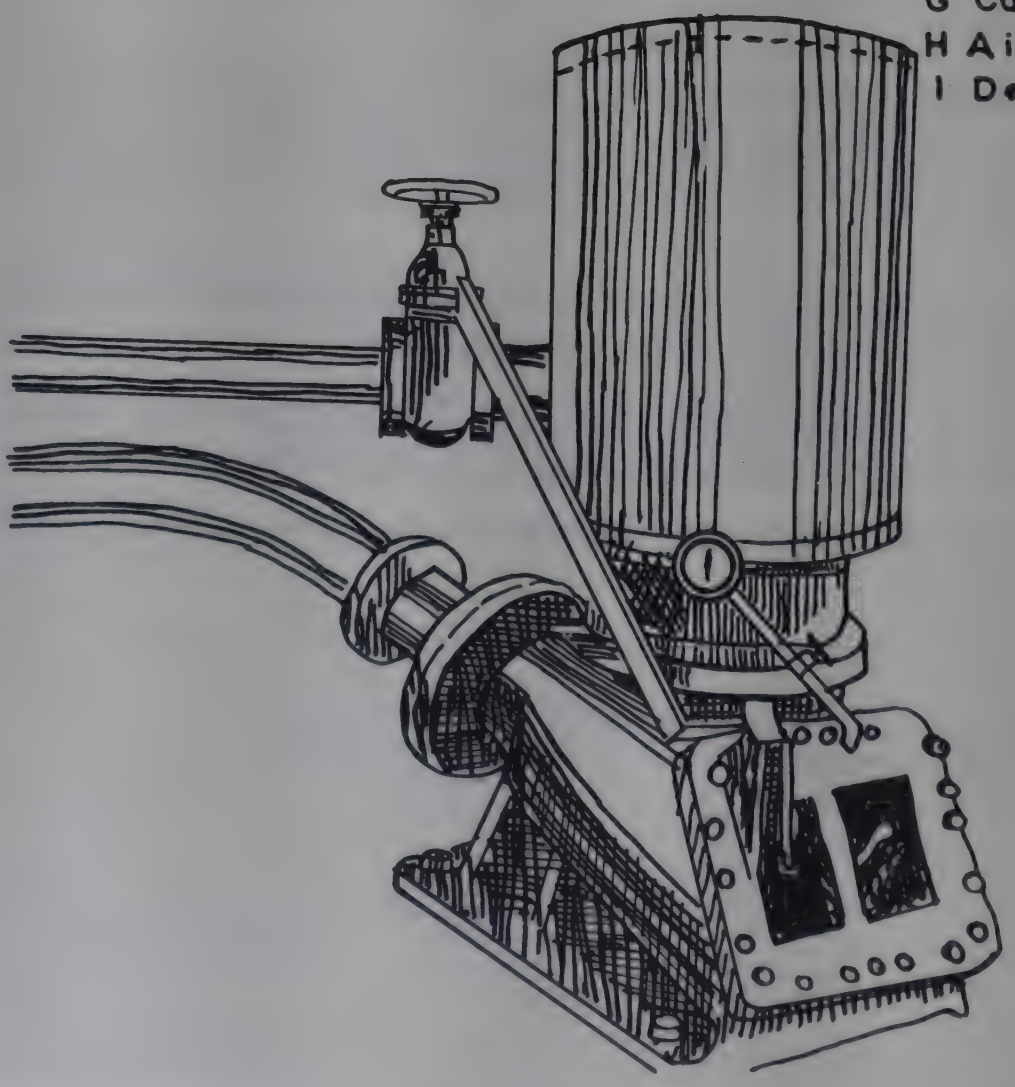
HYDRAM







A Air chamber
B Check valve
C Adjustment wt.
D Drive pipe
E Gate valve
F Outside valve
G Cast iron base
H Air feeder valve
I Delivery pipe



TECHNOLOGY NO. 37

HYDRAM

DESCRIPTION: A Hydram is the best water lifting device, provided sufficient water flow and head are available. It is an excellent water pump which runs only on water power and does not require any other source of energy. It lifts water to a storage tank at least 100 feet high. It is also an appropriate technology for irrigating hilly terrains as well as villages without any electricity.

WORKING: A continuous flow of water from a stream, river or a storage tank is fed into the Hydram. It utilizes the momentum of a relatively large flow of water under a small head to raise a small quantity of water against a large head. It derives power from 'water-hammer' effect, created intentionally. Flowing water's force is captivated in a chamber where air is compressed by the sudden stopping of the main flow of water, and released when the compressed air expands- pushing a small amount of water to a higher elevation than that from which it came. Each compression or decompression of the air inside the chamber propels a definite amount of water up to a storage tank.

ADVANTAGE: The Hyudram is very easy to install, operates continuously and automatically- 24 hours a day- without any attention and practically no maintenance. The initial cost can be recovered in a short span of time due to the saving of diesel and electricity.

COST : The cost of the model (8x4) Hydram pumping 60 gallons per minute and raising the water upto 100 feet is about Rs. 6500/-

SOURCE : S. WALIA ENGINEERING COMPANY
PATEL MARG,
GHAZIABAD - 201 001
UTTAR PRADESH

FERROCEMENT IRRIGATION CHANNEL

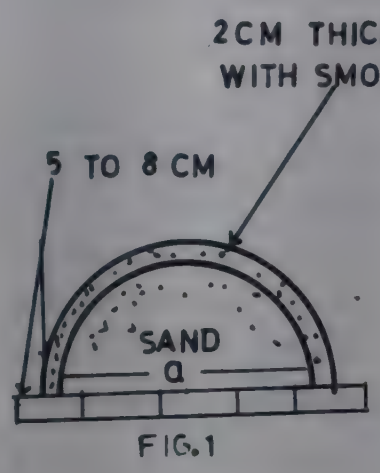


FIG.1

CROSS SECTION AT AA

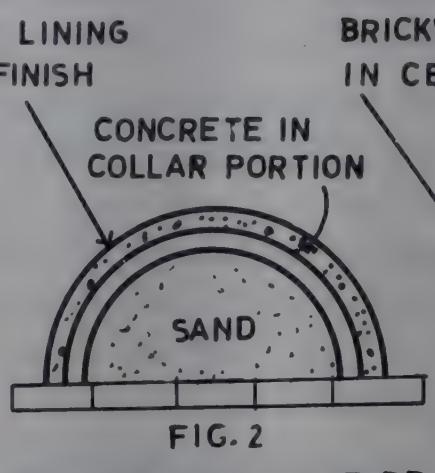


FIG. 2

CROSS SECTION AT BB

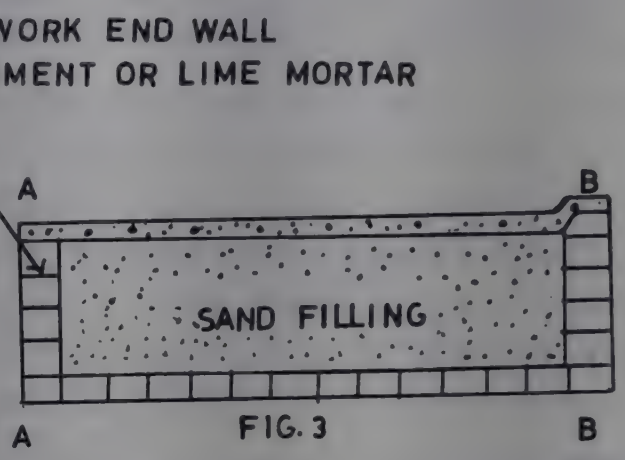
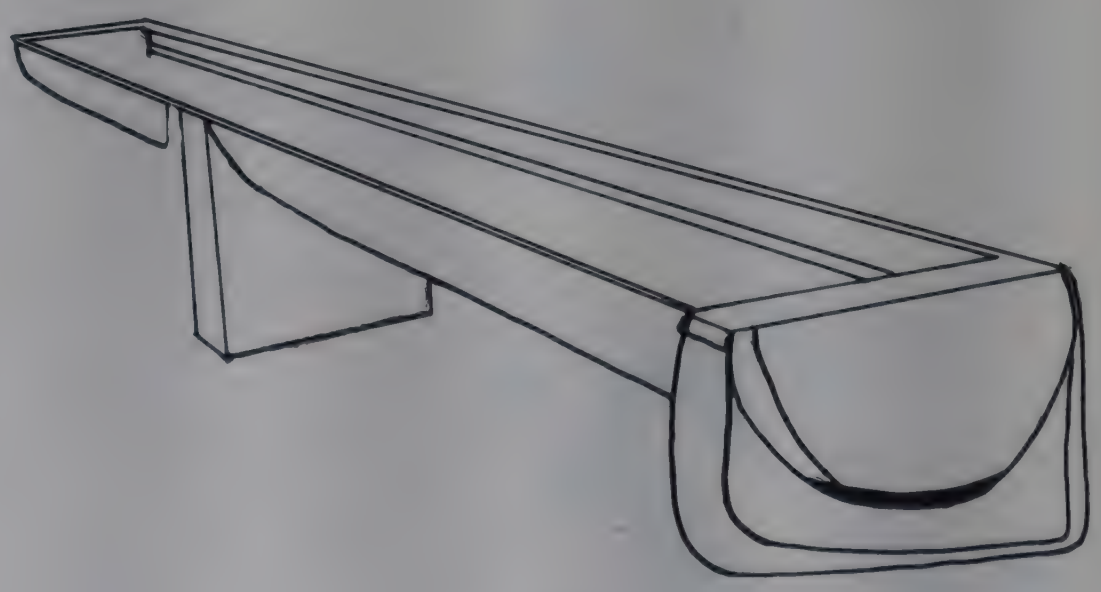


FIG. 3

LONGITUDINAL SECTION FOR MOULD



FERROCEMENT IRRIGATION CHANNEL

TECHNOLOGY NO. 38

FERROCEMENT IRRIGATION CHANNEL

DESCRIPTION : To avoid seepage of water into the soil, ferrocement, a form of reinforced concrete could be utilised for constructing water channels. It is a low-cost technology which could be churned out with locally available materials and localskill. Two people can easily lift and carry the 3 metre pre-cast ferrocement-channels of 30 cm diameter. Hence it is portable, durable and economical as well.

CONSTRUCTION: The channel unit has a built-in collar at one end for joining and laying irrigation or drainage lines at a fast rate. A full scale, cross-sectional sketch of the channel to be pre-cast, showing the coloured and plain ends, is drawn on a sheet of paper, then pasted on a plywood sheet. Alternatively, the sketch could be drawn directly on to plywood. Templates for the mould profiles at both ends are cut from the plywood. The thickness profile may be cut out separately. Moist sand and clay is packed between the templates so that the earth takes on their shape (Figure 1 and Figure 2). A wall is built at either end of the mould using cement/sand or lime pozzolana mortar, finishing 2 to 2.5 cm below the profile template (Figure 3). A concrete line 2 to 2.5 cm thick, is laid over the earth's surface and finished with a neat cement slurry to achieve a smooth surface.

The reinforcement cage for the channel unit, which is made of steel wires and wire meshes, is placed over the oiled masonary mould over which a layer of an old newspaper sheet is spread. A rich cement-sand mortar (1:2) is applied over the reinforcement cage and compacted with the vibration-cum-compaction device, which also provides a uniform shape to the unit.

ADVANTAGES: The channel units are lighter than RCC water channels of semi-circular shape, are cheaper than 9 metre brick-work irrigation channels, and could be repaired easily. If no electricity is available, the units could also be cast by hand-application of mortar.

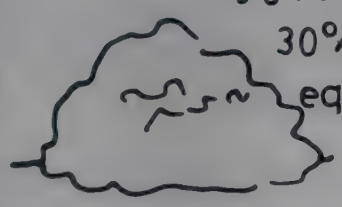
COST : About Rs.30 per metre, for casting a 30 cm diameter semi-circular unit.

SOURCE : THE DIRECTOR,
STRUCTURAL ENGINEERING RESEARCH
CENTRE (SERC)
ROORKEE
UTTAR PRADESH

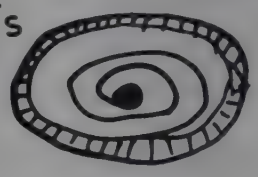
DRIP IRRIGATION

1. CLAY
2. CLAY SOIL
3a MALE MOULD 3 b FEMALE MOULD
4. STRAW (SACCHARAM MOONJA STEM)
5. MOULD WITH ROLLED CLAY & STRAW
7. EMITTER WITH A THOROUGH HOLE AFTER THE STRAW IS REMOVED.
6. EMITTER OUT OF THE MOULD WITH STRAW.
8. FIRING OF DRIED EMITTERS (CLAMP SYSTEM)

1 Pottery clay mixed with 50% horse-dung to attain 30% porosity (3.5 kg clay is equal to 100 Emitters)



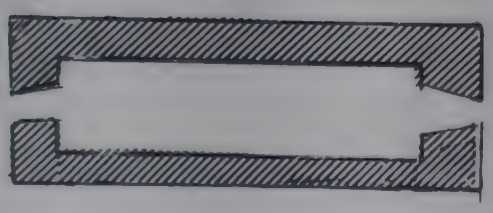
2 Clay coil to facilitate faster moulding of emitters



3a

4

3b



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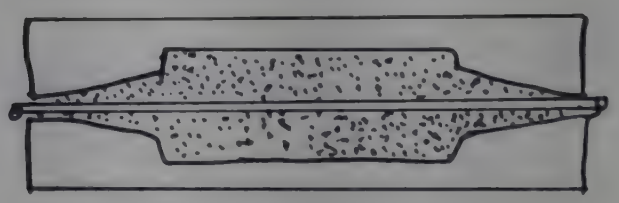

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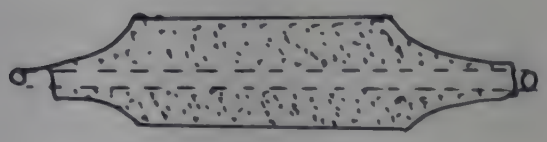

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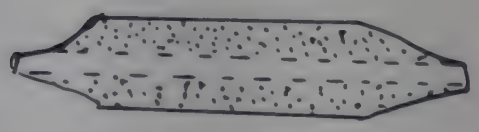

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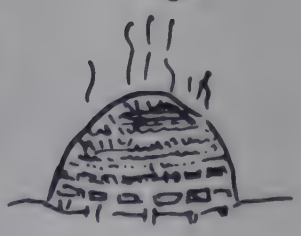


TECHNOLOGY NO. 39

CLAY EMITTER IRRIGATION

DESCRIPTION: Clay Emitter irrigation or bottle-feeding the plant roots is probably the best form of irrigation. If a porous clay cup, filled with water, is placed in the dry soil keeping the free water surface in the cup open to atmosphere and its wall covered with dry soil, all the water from the cup will seep into the soil. This seepage of water from the porous cup to soil takes place due to the soil-suction or soil-water tension. This principle is utilized in suction irrigation. This enhances net agricultural production by harvesting soil energy and making the field and root zone as reservoirs.

CONSTRUCTION: In this irrigation system, fired hollow porous 'emitters', resembling the bails of cricket wickets, made of cowdung and clay are embedded in the root zone of plants and connected by polythene tubes. The emitter and connecting tube are filled with water, after removing the entrapped air. All the joints of emitters and tubes are made air-tight to make the suction line in the rows of plants free of air. The heart component consists of a water tank and an air-tight regulating valve. The capacity of the tank depends on the evapo-transpiration rate of the crop to be cultivated. Usually, a tank having 3000 litres capacity is sufficient for irrigating one hectare of brinjal, tomato, cauliflower, cabbage, knolkhol, water melon, and melon on daily basis.

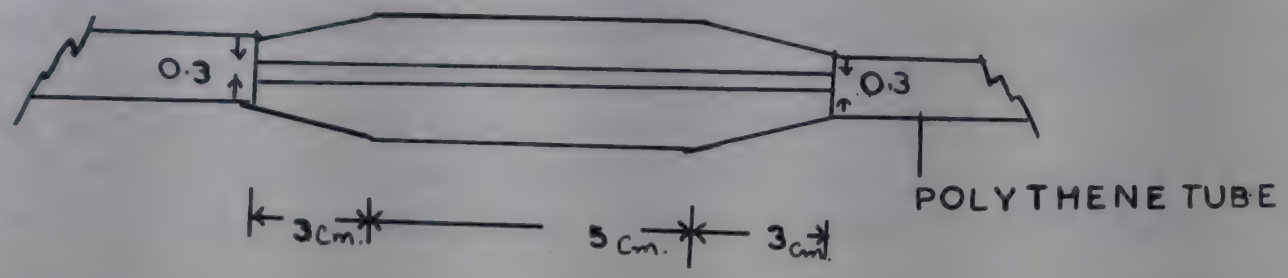
The regulating valve supplies water and fertilizer mixed with water to feeder or main pipe. The tail component is the main feeder pipe with laterals spread on the field in rows. The laterals hold the emitters through which irrigation water seeps into the plant root zone, due to soil and plant suction. The emitter serves as a conduit and reservoir to succedding emitters and a sensor for water emission.

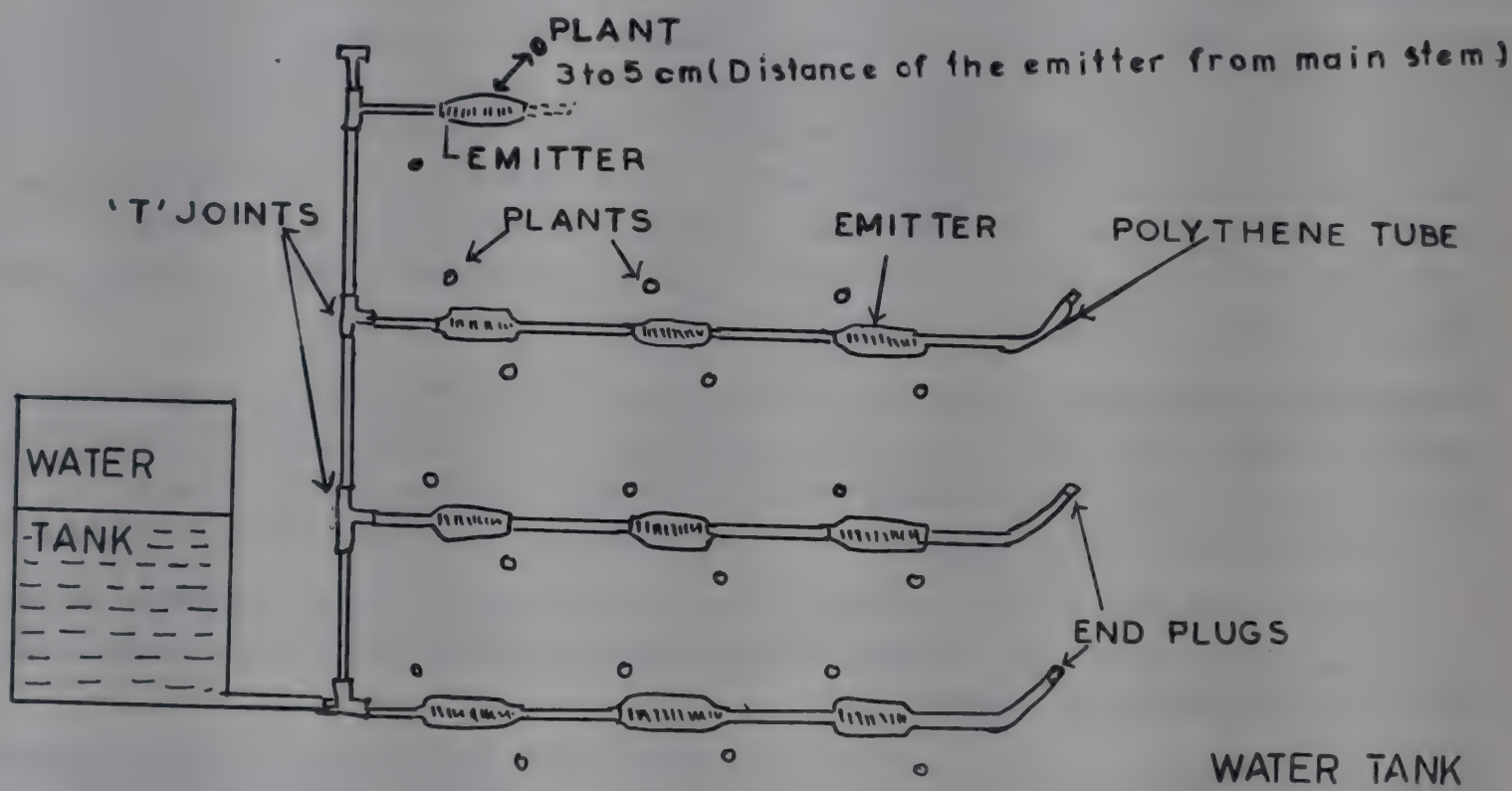
An emitter with internal diameter of 4 mm, 20 mm external diameter and a length of 100 mm was found most suitable for irrigating brinjal, tomato, cabbage, cauliflower, knolkhol, water melon and similar other vegetables and turnip.

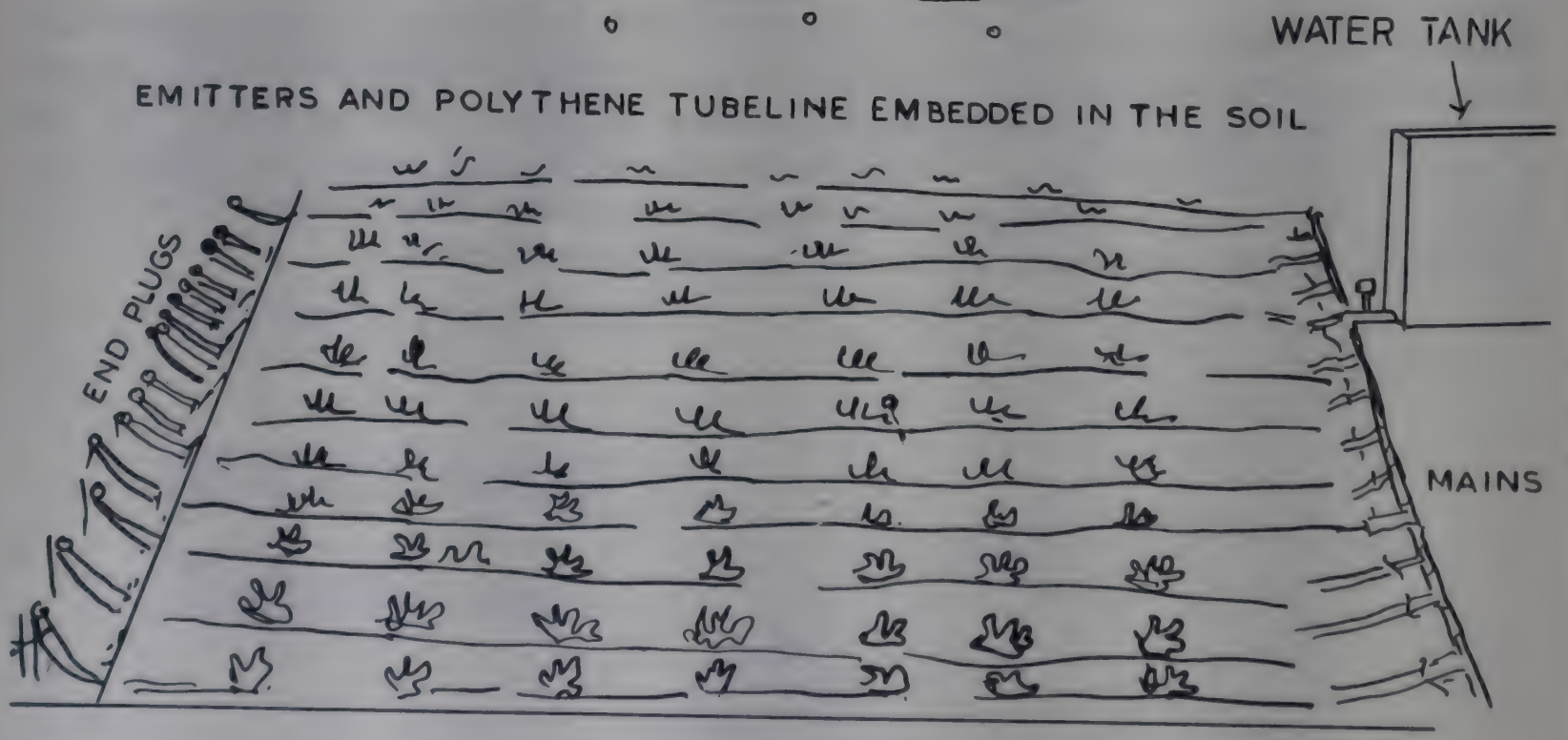
Emitters are embeded in the soil at 10 to 20 cm depth below the crown root to harvest expillary water and to minimise surface evaporation. The horizontal distance between the emitter and plant depends on the diameter of tap root of the plant. Usually, emitters are laid at a distance of 30 to 50 mm from the main stem or tap root to save the emitters from the pressure of enlarged roots. For irrigating fruits like papaya, banana and pomegranate, bigger sizes of emitters than those described above may be utilized with vertical arrangements in or around the root zone of the plant.

Contd. on page no. 77

DRIP IRRIGATION





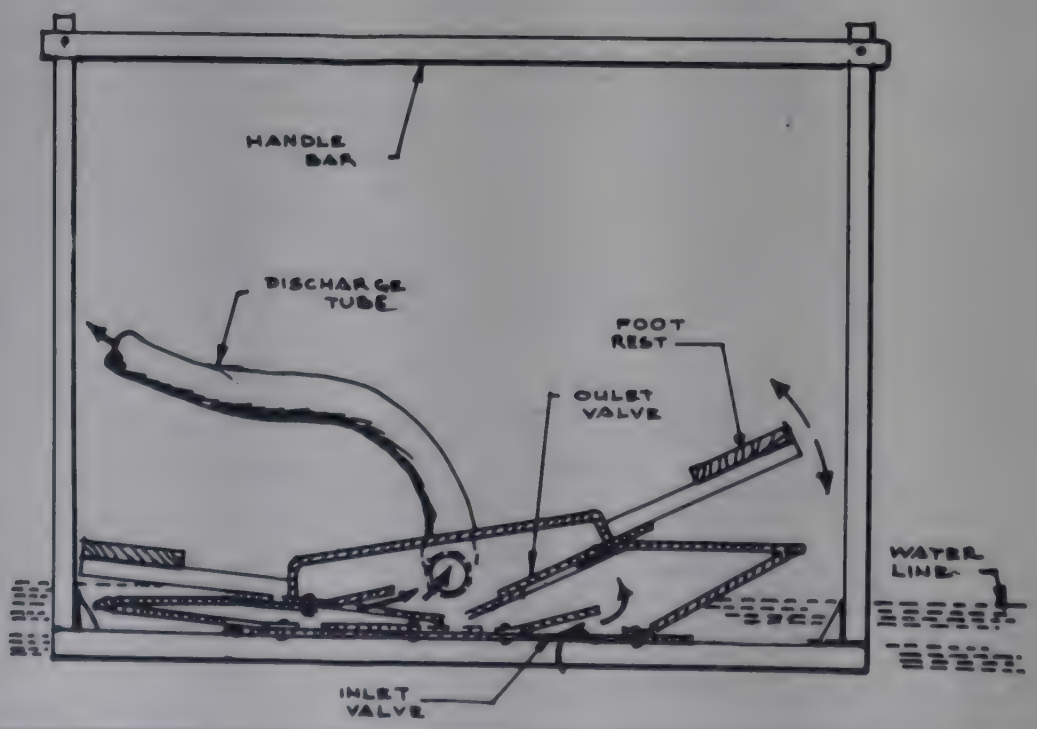


WORKING: The seepage of water from the wall of emitter is due to the soil-suction. This continues till the sum of resistance, head of emitter against the flow of water, and frictional losses in the pipe, emitter and negative static head equal the soil-water suction or tension of root zone of crops.

The soil and/or plants, unlike other methods of irrigation, may be irrigated continuously throughout 24 hours and throughout the life span of plants at the moisture content in the root zone less than or equal to field capacity of the soil. The automation of irrigation is governed by soil-water-plant system and negative static head applied to the water tank. No external mechanical or hydrogenic power is required to cause the flow in the tube and into the emitter and soil interface.

SOURCE : DR. R.K. YADAV,
COLLEGE OF AGRICULTURE
JOBNER, RAJASTHAN

BELLOWS PUMP



TECHNOLOGY NO. 40

BELLOWS PUMP

DESCRIPTION : This low-cost pump can lift 50 to 60 gallons of water per minute to a height of 1 to 2 metres.

The IRRI bellows pump is well-suited for pumping water from irrigation ditches, open channels, river banks and shallow wells. It can also be used for drainage and other low lift applications. Unlike most pumps, it can handle muddy water with small stone granules or other solid impurities.

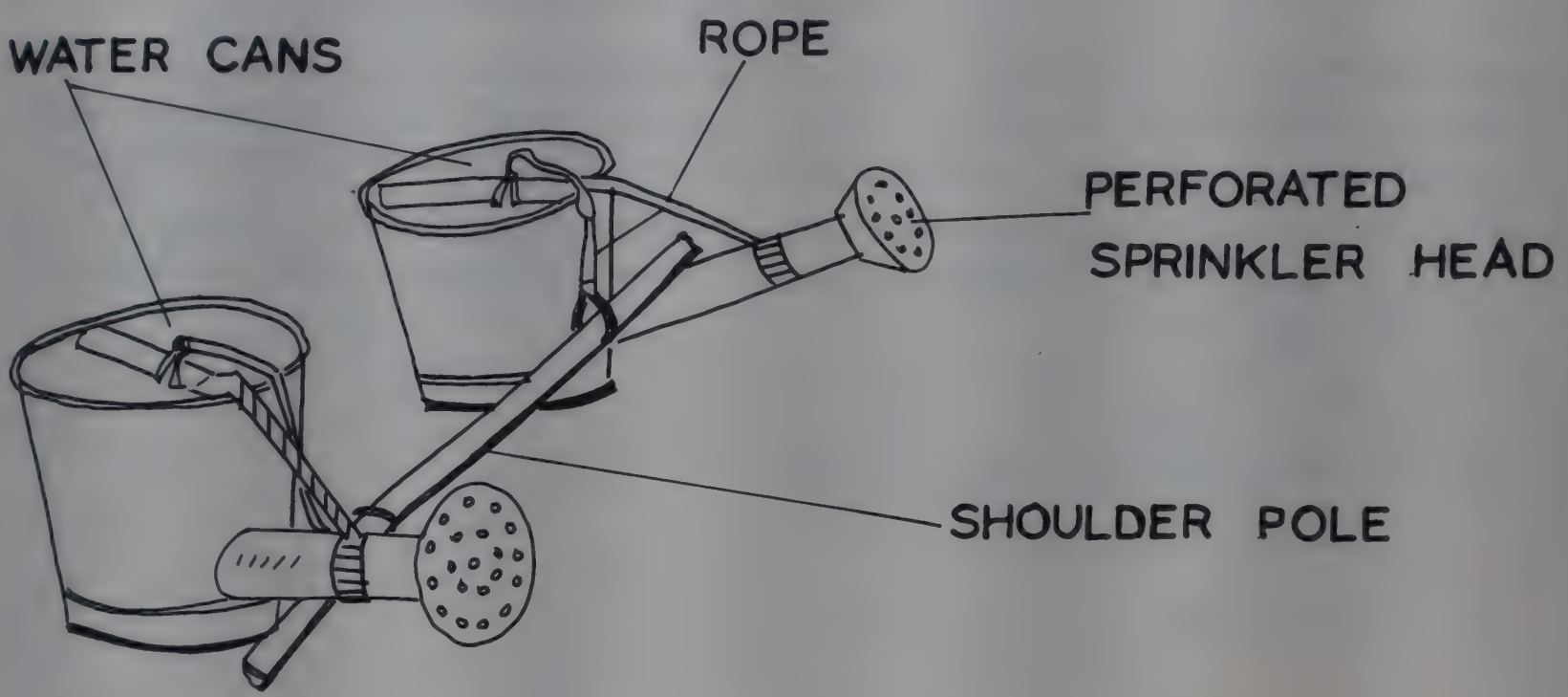
CONSTRUCTION: The Foot Pump is made of two canvas bellows, reinforced with metal inserts. The entire unit, equipped with a handle for convenient carrying, weighs 20 kilos. The design is rugged, for long service and easy repair, yet simple enough to be manufactured through small work shops.

WORKING: The operator stands on the foot-rests and shifts his weight from one foot to another. This compresses bellows, forcing water from the outlet valve by alternately shifting her weight in a rhythmic manner.

COST : Rs. 125/- to 150/-

SOURCE : AGRICULTURAL ENGINEERING DEPARTMENT
INTERNATIONAL RICE RESEARCH INSTITUTE
POST BOX 583 MANILA, LOS BANOS
LAGUNA
PHILIPPINES.

DOUBLE WATER CAN



COMPLETE UNIT

DOUBLE WATER CAN POLE IN USE

TECHNOLOGY NO. 41

DOUBLE WATER CAN

DESCRIPTION : Sprinkling the soil around plants is an efficient method of watering instead of flooding ditches around the rows or mounds upon which the plants are grown. If water is to be lifted or carried to the fields, sprinkling is often the only alternative. Two watering cans tied to a shoulder pole can be used for this purpose. This technology is of special significance in watering forest nurseries.

CONSTRUCTION: Two large cans, either buckets or empty circular paint cans, with a capacity of 20-25 litres are fitted with a pipe at the base of each can. At the end of each, a large perforated sprinkler head is fitted. It should be kept in mind that the level of the sprinkler head should be always equal to or a little higher than the can.

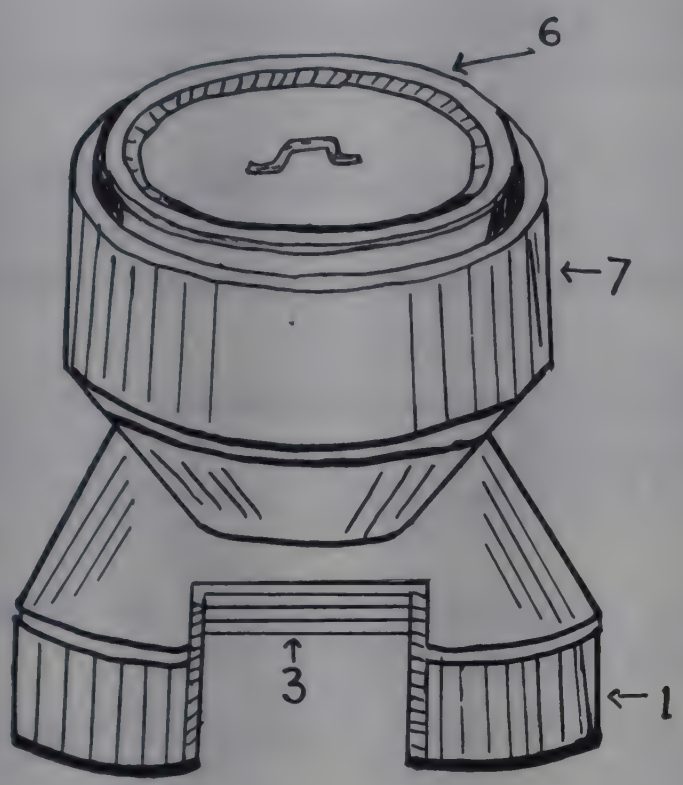
WORKING: The cans are then hung by ropes from both ends of a one metre long shoulder pole. Once the cans are filled, they are carried to the field. Walking between the rows or mounds of plants, the carrier holds the handles on the tops of the cans and tilts forward gently. In this way water is sprinkled on either one or both rows of plants.

Cans can be prepared from discarded tins and skills to make them are available in the villages. Sprinkler heads can be made by perforating a simple metal sheel with nails.

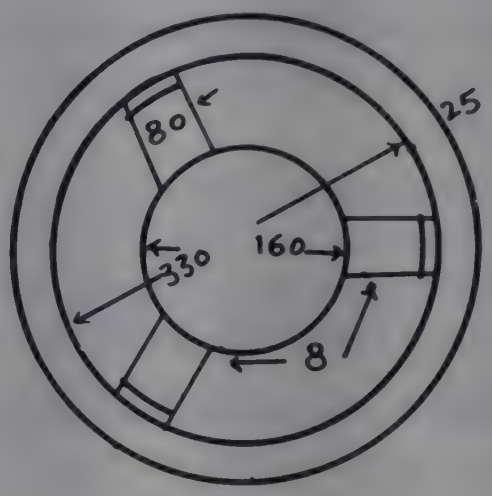
COST : Two drums would cost approximately Rs. 60-70. The cost of the pole and ropes would vary depending upon cost of local materials.

SOURCE : MR. CRAIG THORBURN,
NATIONAL INSTITUTE FOR ECONOMIC &
SOCIAL RESEARCH WIDYA GRAHA
STREET: JALAM JEND JATOT SUBROTO
JAKARTA
INDONESIA

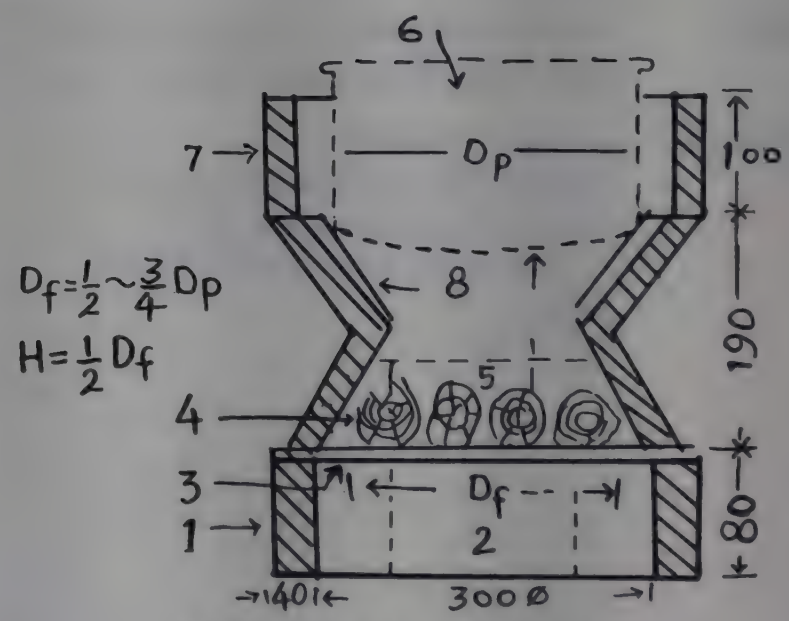
DAMRU CHULHA



PICTORIAL VEIW



PLAN



Sectional Elevation

Dp- Diameter of cooking pot
Df- Diameter of fire
H- Distance between fuel top & cooking pot bottom
1 - Construction for ash pit 2 - Ash pit window 3-Grate
4- Fuelwood 5-Fuel charging window 6-Cooking pot
7- Shield for cooking pot sheet metal/clay
8- Three equidistant ribs to support cooking pot

TECHNOLOGY NO. 42

DAMRU CHULHA

DESCRIPTION : The Damru Chulha is a thermally efficient wood cookstove which saves 30-50% of fuelwood. This improved chulha is simple in design and could be easily fabricated by the local potters. It can be made portable as well as stationary.

CONSTRUCTION : The Damru Chulha has the shape of the cooling tower of a thermal power station. The double conical shape of the chulha caneither be cylindrical or double-conical with uniformly thick walls. The chulha is made of clay with various additives to prevent cracking and provide better binding and porosity. A clay ring is used to shield the cooking vessel to prevent heat losses during windy periods.

Wooden moulds or sheet iron can be used to attain the inside shape. The chulha body and the heat shield for cooking vessels are moulded separately. The heat shield must be made of fired clay whether the body is fired or not.

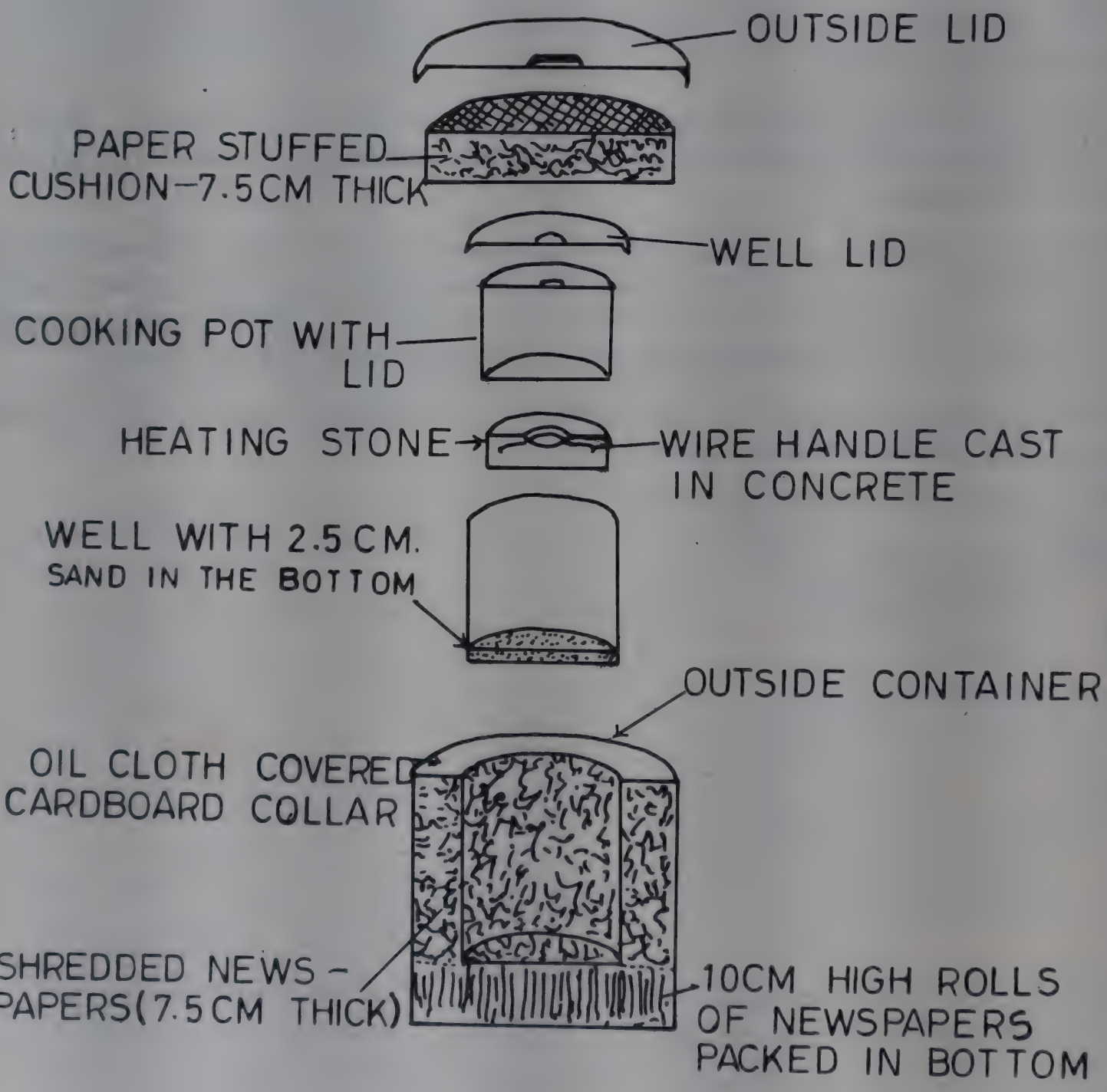
WORKING : An iron grate, carrying the firewood, improves the combustion as the air enters from under the grate and passes through the fuelbed. The thorough mixing of the air and fuel initiates the combustion of volatile gases, even before they enter the space above the fuel bed. The grate and double conical shape, both, guarantee improved combustion even without any chimney.

The total time taken by the Damru chulha to boil three and half litres of water is twenty minutes as compared to the 23 minutes taken by a gas stove.

COST : Rs. 30/- (Mould : Rs. 150/-)

SOURCE : RAHUL PARIKH
SURUCHI VASAHAT
KRISHI YANTRALAYA
BARDOLI
GUJRAT

FIRELESS COOKER


OUTSIDE LID
PAPER STUFFED CUSHION—7.5CM THICK
WELL LID
COOKING POT WITH LID
HEATING STONE
WIRE HANDLE CAST IN CONCRETE
WELL WITH 2.5 CM. SAND IN THE BOTTOM
OUTSIDE CONTAINER
OIL CLOTH COVERED CARDBOARD COLLAR
SHREDDED NEWS-PAPERS(7.5 CM THICK)
10CM HIGH ROLLS OF NEWSPAPERS PACKED IN BOTTOM

TECHNOLOGY NO. 43

FIRELESS COOKER

DESCRIPTION: Where fuel is scarce, the fireless cooker is a boon, since it keeps food cooking with a small amount of heat stored in hot stones. Thick layer of insulating material around the pot prevents heat loss.

CONSTRUCTION: Cut 10 cm wide strips of newspaper, several layers thick. Roll each into a cylinder with a central hole thicker than a pencil. Pack these on end into the bottom of the outside container (See Figure). They will support the well, stove, and cooking pot.

Put the well or the inside container in place and pack the insulation (newspaper, wool, cotton, sawdust, etc.) around it to within 1 cm of the top. Place one inch thick layer of clean sand at the bottom of the well to prevent the stone from scorching the paper rolls and causing fire.

To make a concrete heating stone, place a 5 cm cardboard band or collar on heavy paper or board to form a circle-the size of the stone desired. Mix 4 cups each of cement and sand (0.95 litre). Then pour in enough water (1.5 cups to form a stiff mush). Fill the collar, casting in a wire handle for lifting the hot stone. Let the stone stand for 48 hours, then remove the collar, place it in cold water and boil for 30 minutes. Cool it slowly.

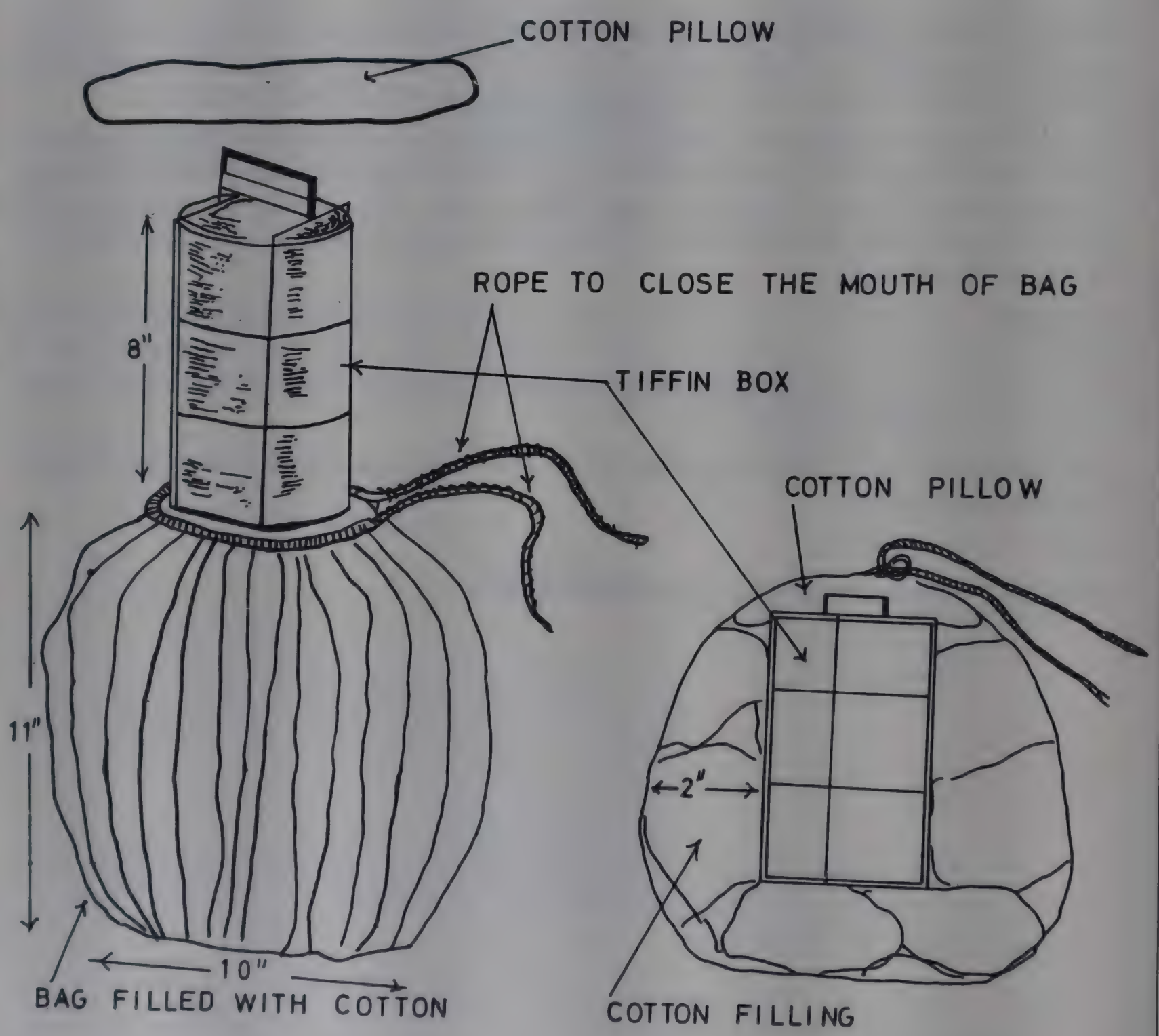
WORKING : Very little water is used in the fireless cooker as there is hardly any loss by evaporation. Most foods are brought to a boil and cooked for 5 minutes on another stove. The heating stone is heated and placed in the cooker. Then the covered cooking pot is set on the hot stone in the cooker and the lid is placed on the well.

PRECAUTIONS : 1. The cooker's lid should be left partially open. 2. Heating stone and cooking pot should be clean and dry.

COST : Rs. 100-150/-

SOURCE : INTERMEDIATE TECHNOLOGY DEVELOPMENT GROUP
9 KING STREET
LONDON WC 2E
UNITED KINGDOM

HAYBAG COOKER



TECHNOLOGY NO. 44

HAYBAG COOKER

DESCRIPTION: Haybag cooker is an energy-saving cooking device. It saves fuel from 25% to 50%, depending on the cooking medium — whether charcoal or biogas.

MATERIALS: The Haybagcooker is filled on all sides with 3-5 inches thick layer of any of the following insulating materials:

Hay
Feather
Raw Cotton
Old woolens
Fibre glass
Old newspaper shreddings

The bag can be stitched out of cotton, plastic or leather.

WORKING: Cook the food till it achieves the boiling point. After boiling it for five minutes, pick up the cooking vessel from the fire and put it inside the haybag. The well-insulated walls of the haybag retain the heat and assit in completion of the cooking process. It generally takes no more than half an hour for cooking the food in the hay box. However, it is advised that the bag should not be opened for at least one hour for a tasty outcome.

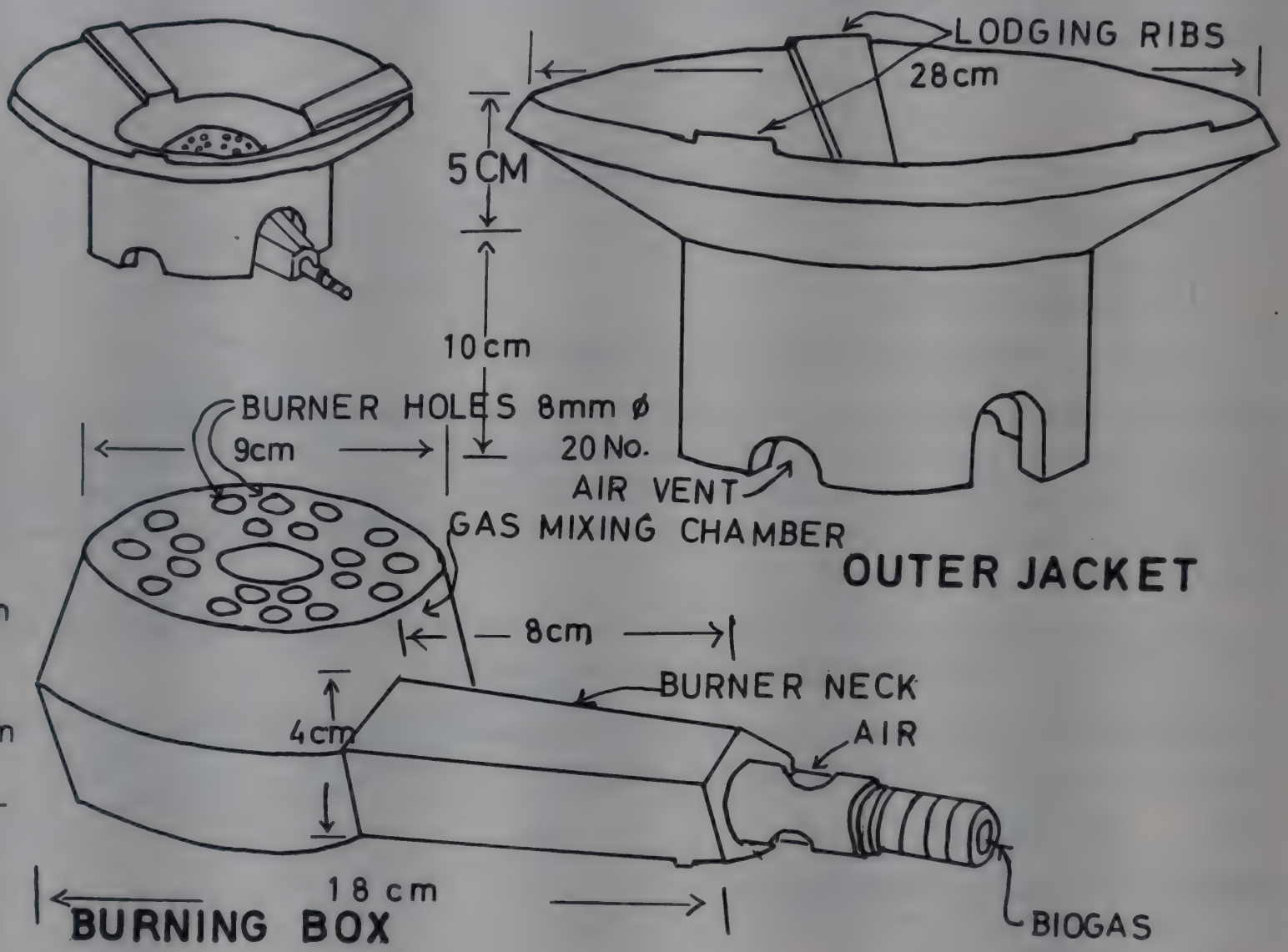
In order to attain optimum results, hard pulses, and food grains like pigeon peas should be broken into small pieces and soaked for abour 4 hours prior to cooking.

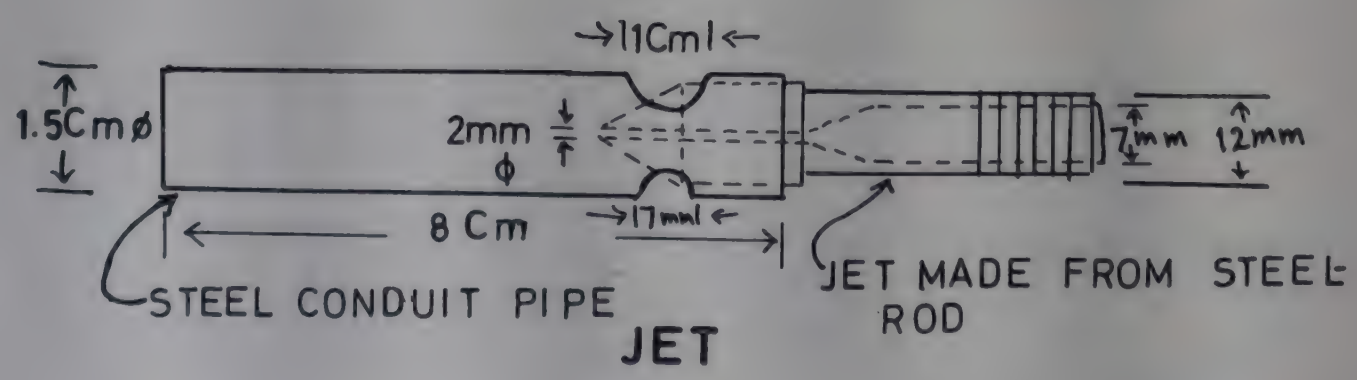
ADVANTAGE: The haybag is portable - like a haversack and could be carried easily on a bicycle. The cooked food, inside the haybag, remains hot for about 4 or 5 hours.

COST : Rs. 20/- only

SOURCE : CENTRE OF SCIENCE FOR VILLAGES
MAGAN SANGRAHALAYA
WARDHA - 442 001
MAHARASHTRA

CLAY BIOGAS BURNER





TECHNOLOGY NO. 45

CLAY BIOGAS BURNER

DESCRIPTION : A simple, economical burner made of clay which is 3 to 4 times cheaper than the conventional metallic burners and equally efficient is evolved by the Centre of Science for Villages, Wardha in Maharashtra.

CONSTRUCTION : The Clay Biogas Burner comprises a burning box, an outer jacket and a metallic jet. First two components are made in clay and fired in a pottery oven at 700°C, while the jet is fabricated in a mechanical workshop using mild-steel conduit pipe and steel bar. The burning box and outer jacket are fabricated using wooden mould and potter's wheel, respectively.

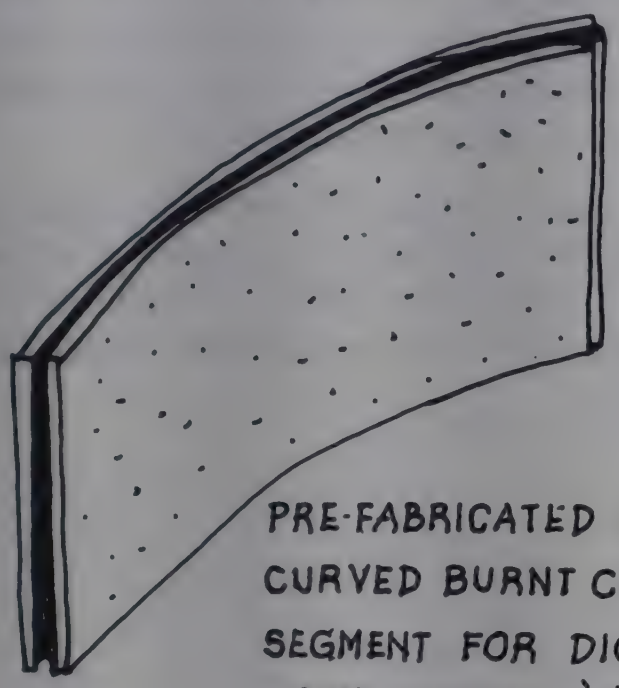
WORKING : The outer jacket is designed to accommodate utensils of variable sizes. The design of the jet helps appropriate mixing of air and biogas for efficient burning. The burner runs at the flow rate of 8 cubic feet of biogas per hour. One outer jacket contributes about 4% of the total thermal efficiency of the burner, bringing the burner's over-all thermal efficiency around 56% whereas the commercial burners claim to have a thermal efficiency of 60%.

COST : About Rs. 50/- only

SOURCE : CENTRE OF SCIENCE FOR VILLAGES
WARDHA - 442 001
MAHARASHTRA

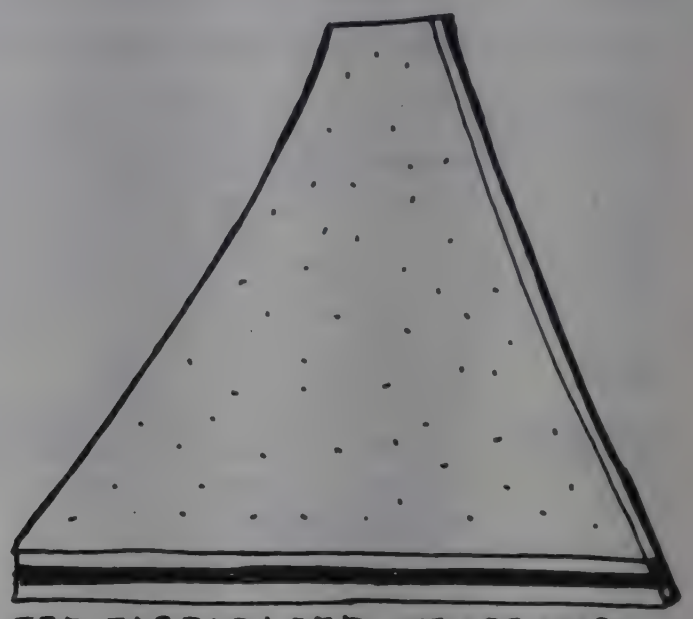
BURNT CLAY SEGMENT BIO-GAS PLANT

RECTANGULAR SEGMENT

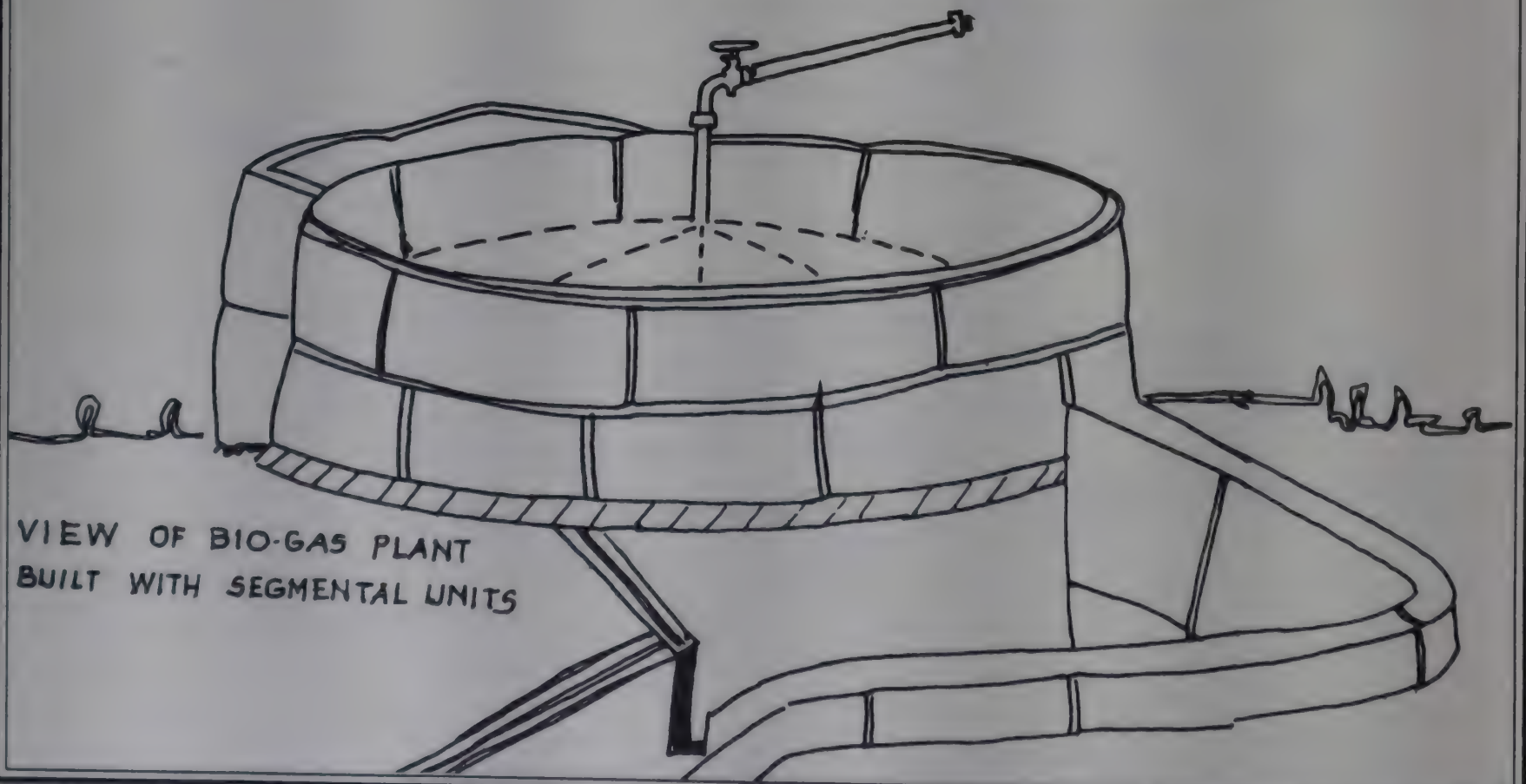


PRE-FABRICATED RECTANGULAR CURVED BURNT CLAY SEGMENT FOR DIGESTER
SIZE : APPROX. 2'-0" × 1'-0" (2" THICK)

TRAPEZOID SEGMENT



PRE FABRICATED TRAPEZOID CURVED BURNT CLAY SEGMENT FOR FIXED DOME (2" THICK)



VIEW OF BIO-GAS PLANT BUILT WITH SEGMENTAL UNITS

TECHNOLOGY NO. 46

BIOGAS PLANT IN CLAY

DESCRIPTION : Biogas plant using clay segments is 25 to 30% cheaper than the conventional design using brick masonary. It can be fabricated in rural ares with local materials, giving a new source of employment to potters and non-potters too. The plant can also serve as a water storage tank.

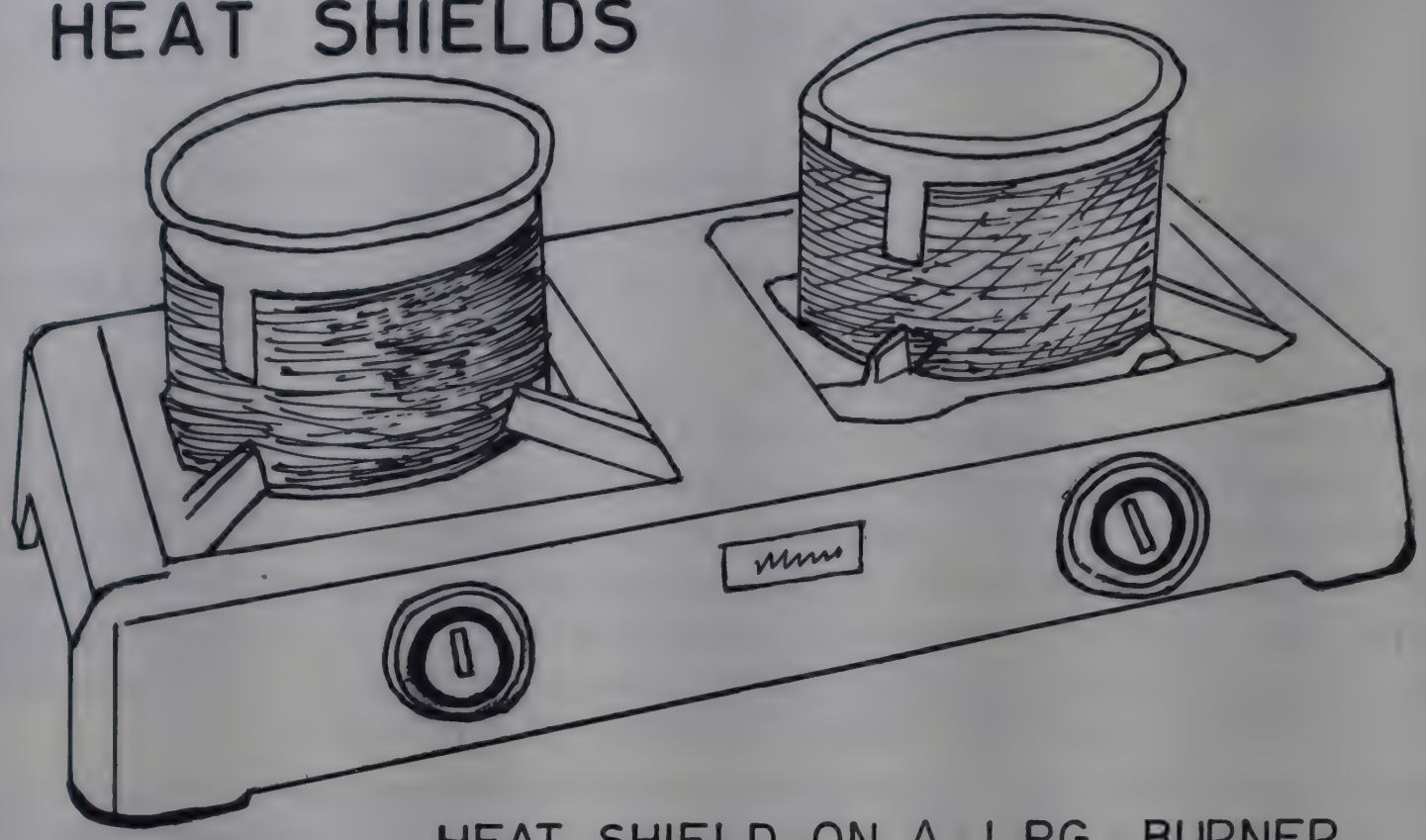
CONSTRUCTION : Each clay segment is of the dimension of 2″ x 1″ x 2.5″. The segments are fabricated using wooden moulds and fired slowly in the updraft kiln at temperature of about 850°C to avoid cracking. The interlocking arrangement provided at edges helps to form a good joint with the help of cement-mortar (Fig. 3). The digester is constructed in the pit by joining segments at their edges to form concentric rings and arranging required number of rings one above the other using cement mortar. The slightly curved surface of the segment helps in easy construction of concentric rings of varying diameters required for different sizes of gas plant. The wall of the digester is internally lined with cement paste instead of plastering with cement mortar.

For construction of fixed dome, the triangular and slightly curved segments, each of size 3″ x 2″ x 2″, are made using wooden mould. (fig. 4). For the dome of 2 gas plant, 8 such segments are required, each of which is further divided into 3 or 4 pieces before being fired. For the construction of a fixed dome, 24 to 32 segments are used, which saves some cement mortar. Since the number of joinaries compared to usual brick masonary are less, the use of cement is substantially reduced.

COST : Rs.3300/- for 2 cubic metre plant

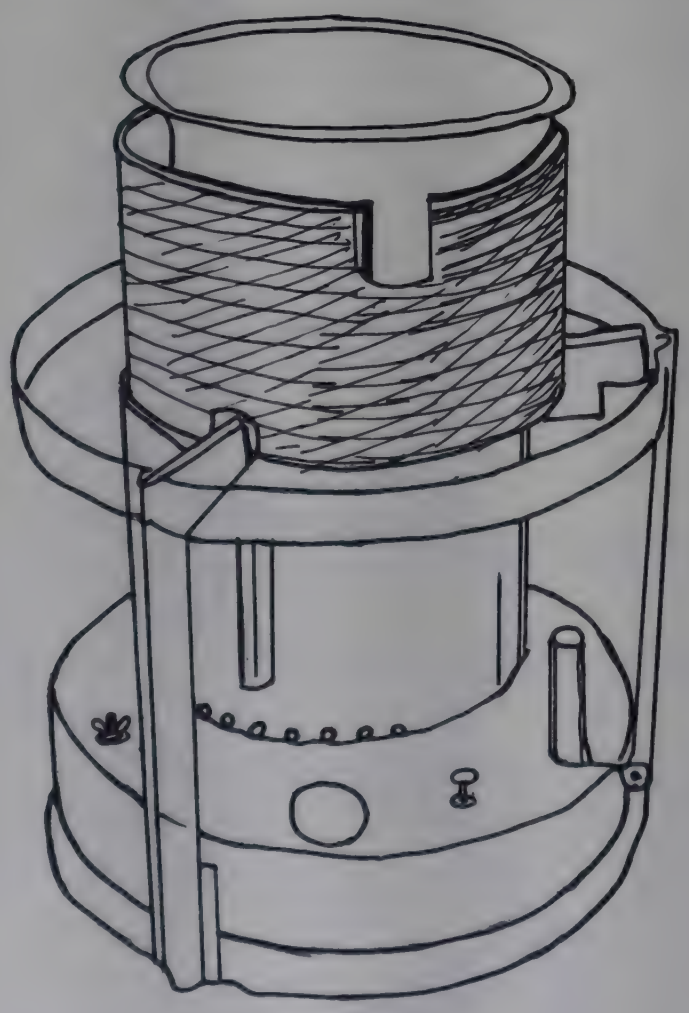
SOURCE : CENTRE OF SCIENCE FOR VILLAGES
MAGAN SANGRAHALAYA
WARDHA - 442 001
MAHARASHTRA

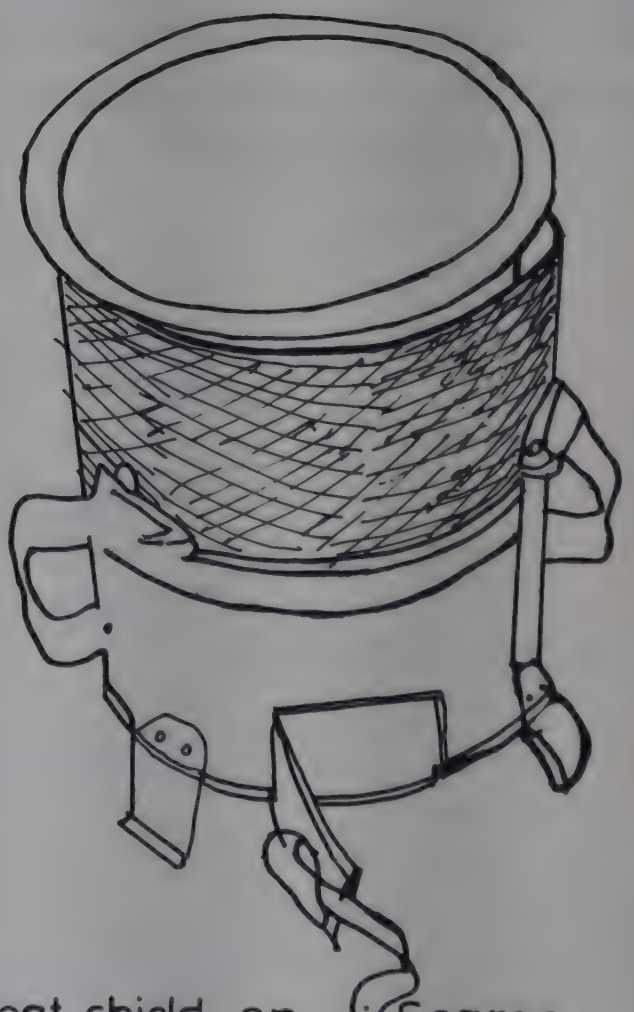
HEAT SHIELDS



HEAT SHIELD ON A LPG BURNER

Heat shield on kerosene wick stove





Heat shield on Segree

TECHNOLOGY NO. 47

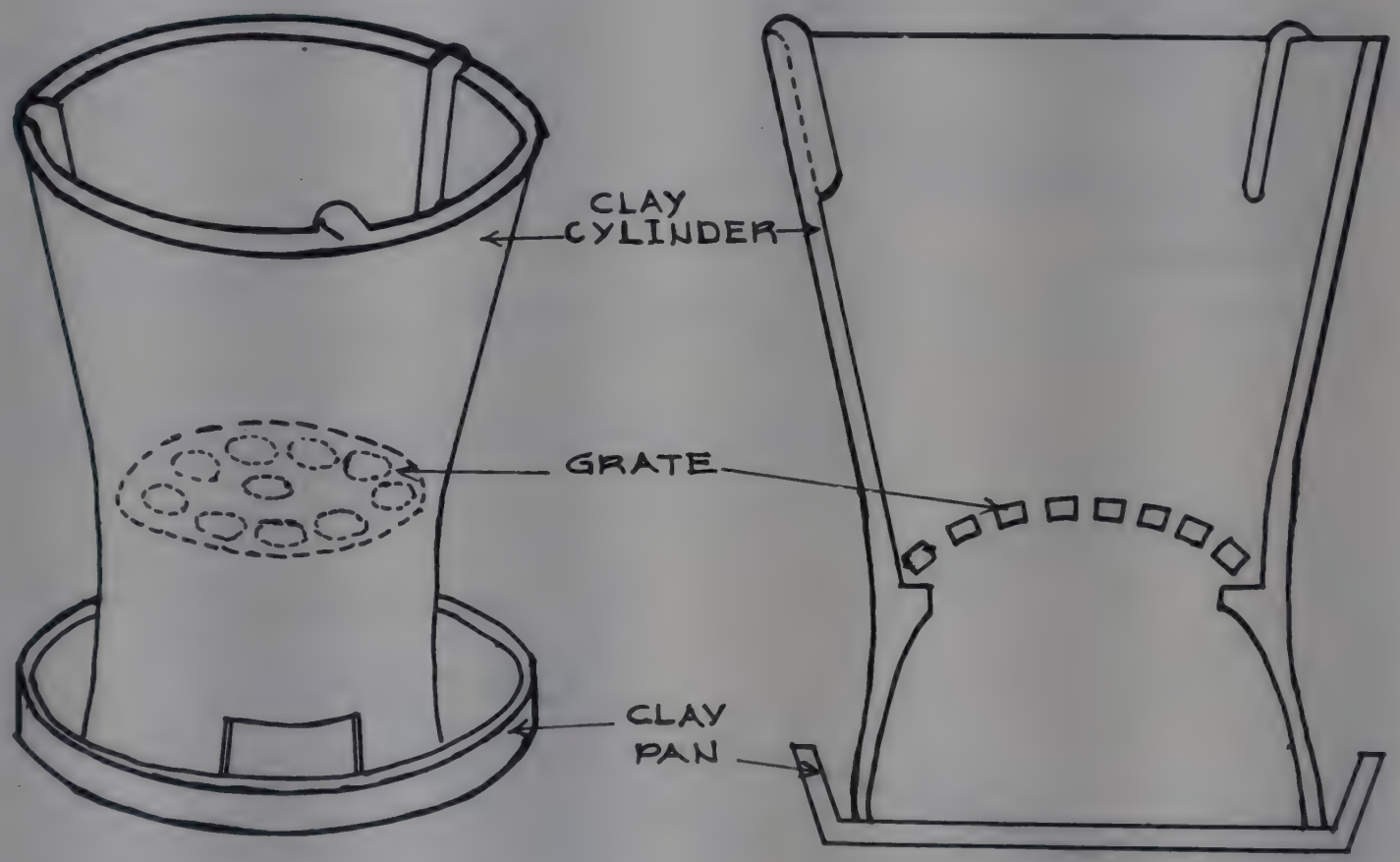
HEAT SHIELDS

DESCRIPTION : An enormous quantity of cooking gas as well as heat in stoves and '*angeethis*' is wasted during cooking due to improper heat-management. This heat-loss is unavoidable, irrespective of the high thermal-efficiency of the stove. Hence, heat shield around stoves, burners or angeethis enhances the thermal efficiency by 20-25%. It prevents the heat-loss due to the direct contact between the hot pot and relatively cold air. Once the air between the heat shield and the container is heated, it acts like a heat-jacket. Hence, there is maximum utilisation of cooking energy and minimum wastage of gas and fuel.

COST : Rs. 25/-

SOURCE : DR. B.D. TILAK
CASTFORD
128/2 KARVE ROAD, KOTHRUD
PUNE - 411 029
MAHARASHTRA

CHARCOAL STOVE



TECHNOLOGY NO. 48

CHARCOAL STOVE

DESCRIPTION : This fuel-saving stove is cheap as well as durable, apart from being simple in design and convenient in use.

CONSTRUCTION : This stove (Fig.1) consists of a clay cylinder with a narrow waist and a 50 cm square side opening at the base. It rests on a clay pan and a removable convex clay grate is positioned inside the clay cylinder, 12 cm below the top. About 300-500 of charcoal is placed within the upper section of the stove and lighted. The ignition time is 15-20 minutes with hardwood charcoal. There is no provision for heat regulation and no method of extinguishing before the full charge has burnt out.

The stove is made from clay, normally used in the manufacture of earthenware cooking utensils and roofing tiles, modified slightly by the addition of fine sand. Rural pottery centres can manufacture the stove by using a pottery wheel. Moulds are not vital, they certainly improve dimensional accuracy.

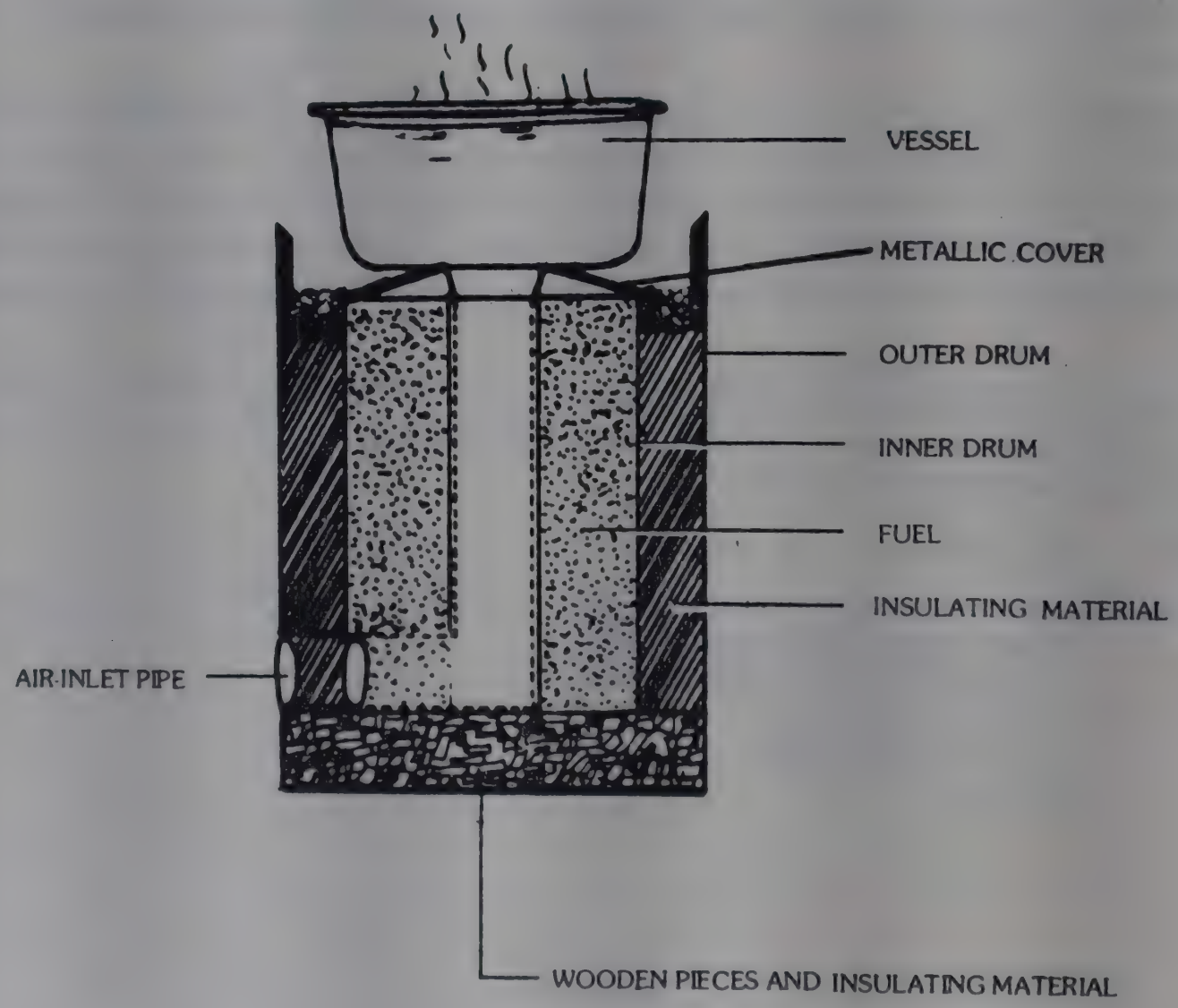
WORKING : The stove consumes charcoal at the rate of 250 gms. per hour with a heating efficiency of 30%. A full meal for five adults is cooked in approximately two hours with a charcoal consumption of 490 gms. Three 1 cm thick ridges, equidistant from each other, traverse from the upper rim to the inside of the stove till a depth of 6 cm. Small vessels fit snugly inside the stove and larger vessels simply rest on the rim, but in all cases, the ridges provide the space required for the escape of exhaust gases.

The grate, (concave-shaped to raise the charcoal bed towards the vessel) has holes in 20% of the grate area, totalling 31 cm. square. The limited air supply through the grate controls the rate of burning which is approximately 250 gms per hour.

COST : Rs. 25/- to Rs. 30 (approx.)

SOURCE : DHAMMIKA DE SILVA, DIVISION OF
WOOD AND CELLULOSE TECHNOLOGY
CEYLON INSTITUTE OF SCIENTIFIC AND
INDUSTRIAL RESEARCH,
P.O. BOX 787, COLOMBO 7
SRI LANKA

DOUBLE DRUM STOVE



TECHNOLOGY NO. 49

DOUBLE DRUM STOVE

DESCRIPTION : Double drum cooking stove saves 10 to 15% fuel. Its insulated walls retain heat which keeps the stove warm for two to three hours. It can be fabricated by blacksmiths with locally available metal sheet from empty drums.

CONSTRUCTION : Double drum stove is made of two cylindrical drums. The outer drum is 30 cm in diameter and 35 cm in height. The inner drum is 20 cm in diameter and 25 cm in height. The outer drum is filled with wooden pieces and cheap insulating material upto 5 cm height. The inner drum is placed in the outer drum so that there is 5 cm of empty space available all around. The space between two drums is filled with any cheap insulating material upto the height of 25 cm. This exposed portion should be properly covered with metallic sheets to avoid the loss of insulating material whilst tilting the drum to remove residue after operation. Two holes of 5 cm diameter are made in both the drums on lower side. The hole is made 5 cm above from the bottom in the outer drum where as to the inner drum, it is just at the bottom since it is placed 5 cm above the bottom of the outer drum. Corresponding holes at the same heights would serve as air-inlet openings.

WORKING : Approximately 5 cm in diameter and 10 cm long pipe (or cylindrical object) is inserted into the air-inlet pipe. Another, same diameter pipe of 32 cm long is held at the centre of inner drum touching the bottom as well as the inner end of air-inlet pipe. Fuel (wood dust, rice husk or wood shavings) is filled in the inner drum and rammed so as to provide a compact semi-solid mass all around the pipes. The pipes are slowly rotated and removed gently so that hollow cavities are preserved. A 21 cm diameter metallic cover with 5 cm diameter hole in the centre is placed on the inner drum. This is also provided with three elevated points at equal distances so that cooking vessel can easily be placed. Now the stove is ready for operation and can be lighted using small wood chips, dry leaves or even pieces of paper. The flame will be practically smoke-free. Depending on the type of fuel, one filling can be used for a duration of 2½ - 4 hours.

COST : Rs. 50/-

SOURCE : DR. V.P.S. SORAYAN
CENTRE FOR RURAL DEVELOPMENT AND
APPROPRIATE TECHNOLOGY
INDIAN INSTITUTE OF TECHNOLOGY
NEW DELHI- 110 016

POTTERY STOVE
(PREVENTIVE MEASURES)

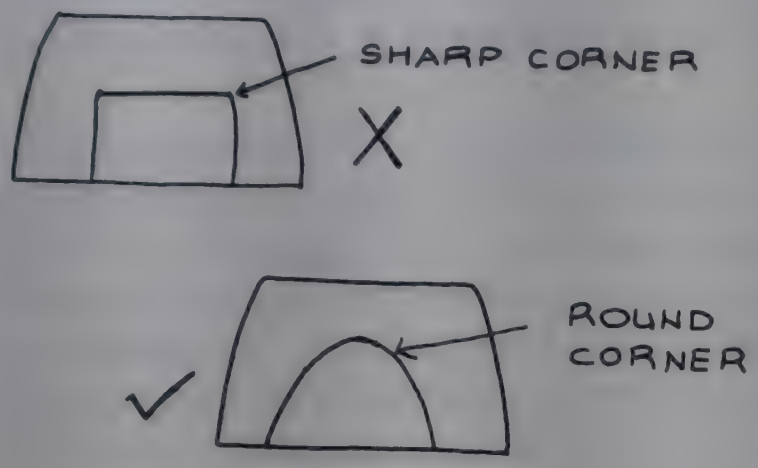


Fig-1

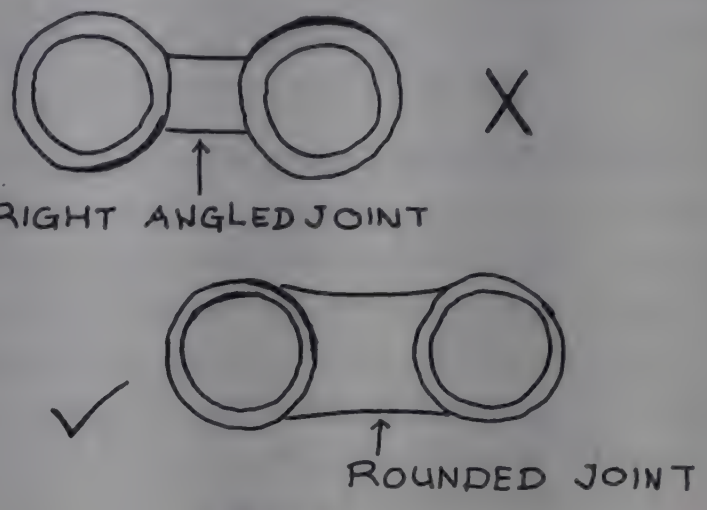


Fig-2

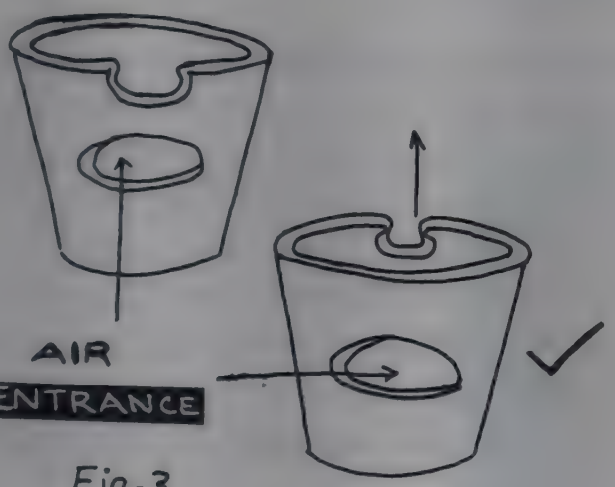


Fig-3

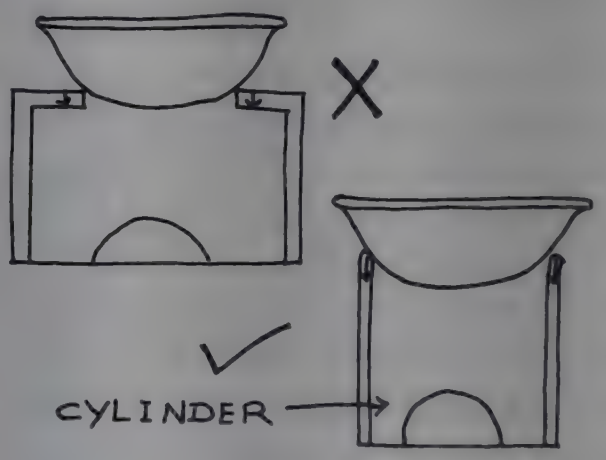


Fig-4

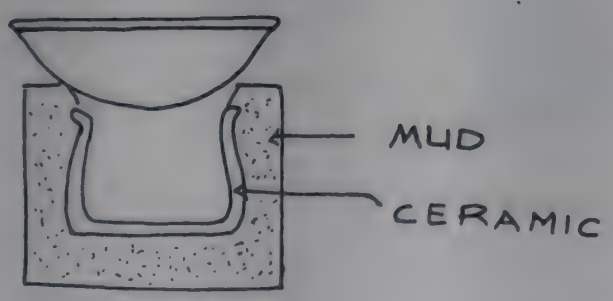


Fig-5

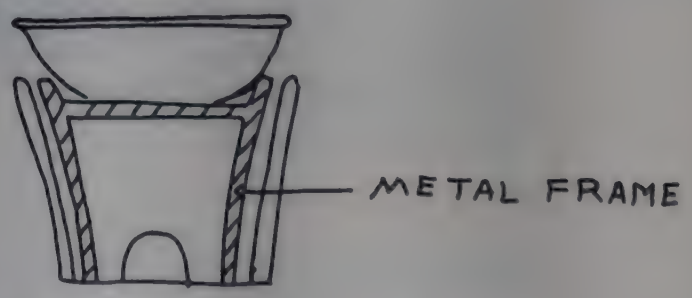


Fig-6

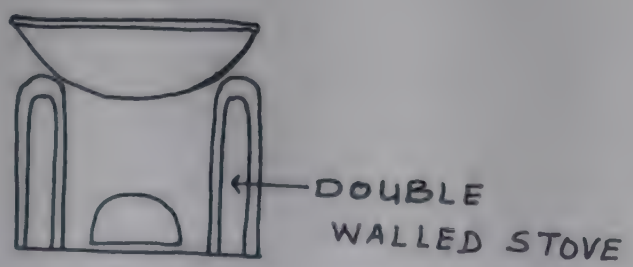


Fig-7

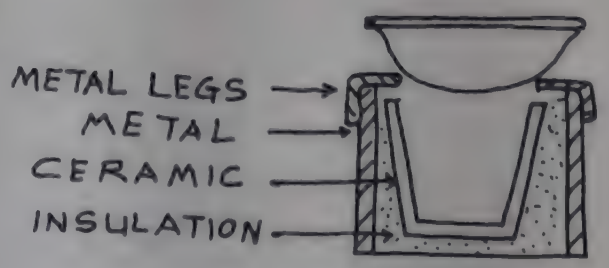


Fig-8

TECHNOLOGY NO. 50

POTTERY STOVE BREAKAGE PREVENTION

DESCRIPTION : Ceramic stoves crack due to thermal stress, but they can also crack because of poor structural design. Fired clay is a very brittle material which has a relatively low strength and a low resistance to impact, and thus cannot bear heavy loads. Ceramic stoves must therefore be carefully designed to reduce the likelihood of fracture.

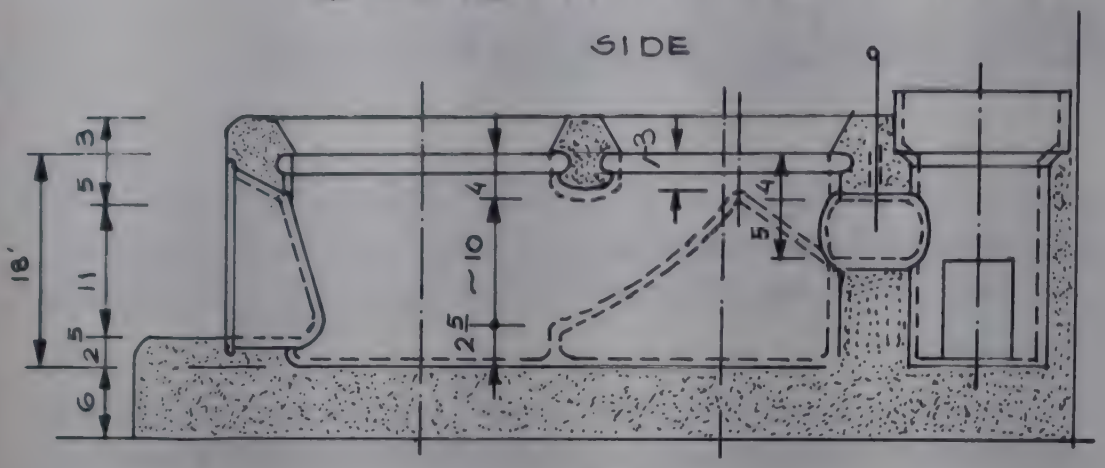
When a material is subjected to a load (for instance putting a pot on a stove) the stress (force per unit area), locally, at the imperfections is very much greater than in the body of the material. Cracks are more likely to originate in right-angled joints, where there is a concentration of stress.

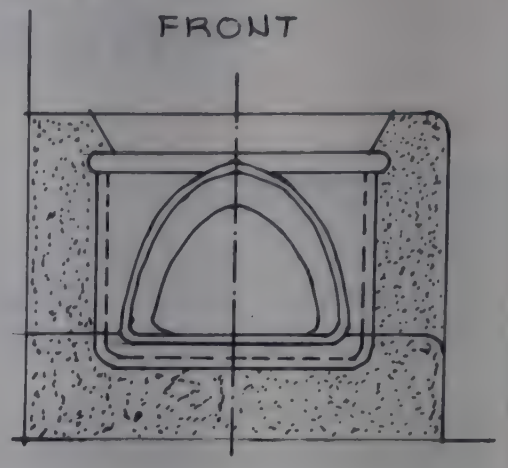
Stoves are not only subjected to mechanical loading but also to thermal loading. Stresses are established when one part of the stove is hotter than another, and the greater the local temperature difference, the higher the stress.

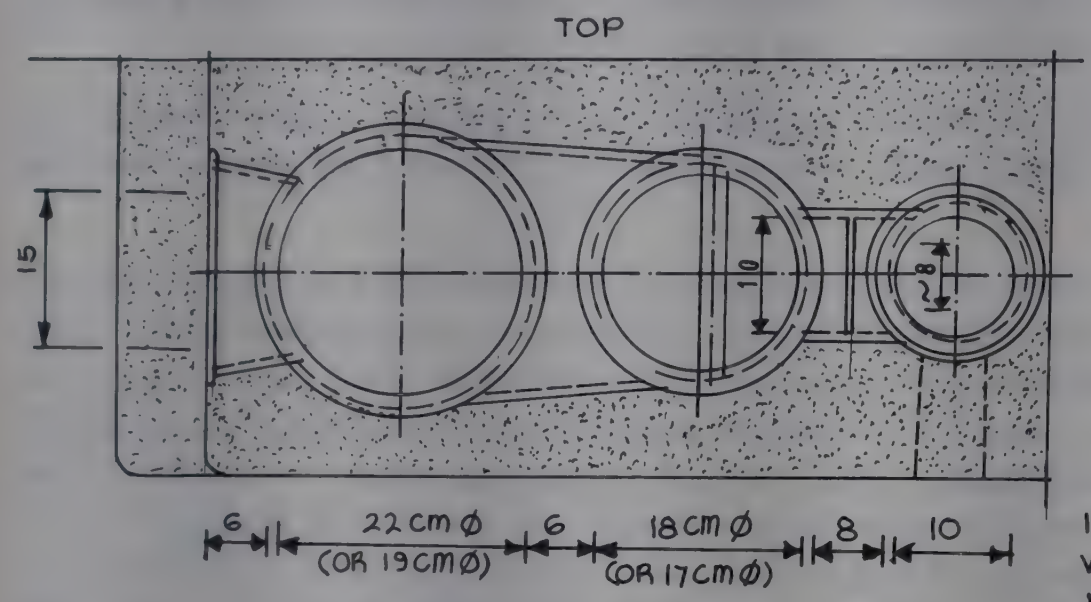
PRECAUTIONS : Avoid putting sharp corners in your stove. For example (fig 1.), in joining tunnels and pieces, make sure joined pieces are gently tapered and rounded, avoiding right angled joints (fig.2). Never place the air entrance and flue gas exit on the same side of the stove. Place them opposite each other. The narrow space left in between is particularly susceptible to stress (fig.2). Always try to build a stove out of cylinders to avoid the high stresses that result from bending in flat shapes i.e., exploit the natural strength of curved shapes (arches or domes) (fig. 3). When the food in the pot is likely to be stirred vigorously during cooking, or if large pots are used, it is essential to reinforce the ceramic, or remove the load from the ceramic in some other way (fig. 4). Place mud around the ceramic and put the pot on the mud (fig. 5). Use a metal frame (fig. 6). Use a double-walled stove (fig. 7). In both (6) and (7) avoid a 'wedging' situation between the pot and the edges of the pot opening, otherwise problems could occur due to differential expansion in the pot and the pot seat. Use an outer metal casing (fig.8). Reject stoves that have black marks after kiln firing on the inside or outside of the firebox. The black mark indicates a spot that has been reduced in the firing. Localized reduction may weaken the clay at this point (fig. 8). Avoid features that give rise to high temperature gradients for example, baffles under the second pot seat.

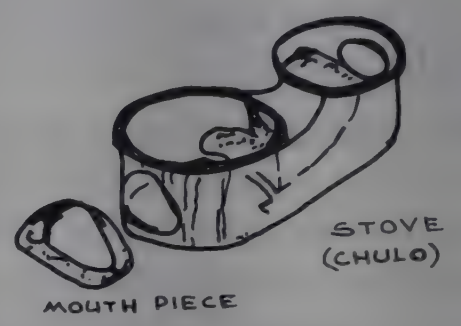
SOURCE : STEPHEN JOSEPH
ITDG STOVES PROJECT,
APPLIED RESEARCH SECTION,
SHINFIELD ROAD, READING(BERKSHIRE)
RG2 9 BE
UNITED KINGDOM

GANDHI NIKETAN CHULO

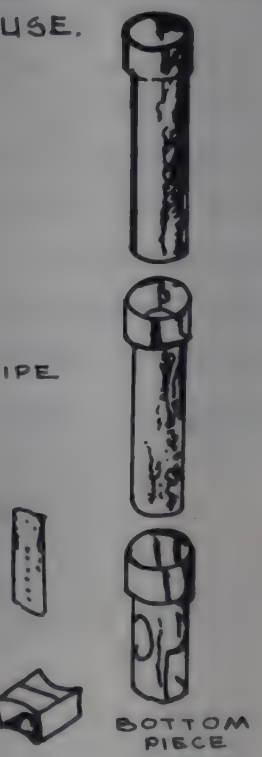




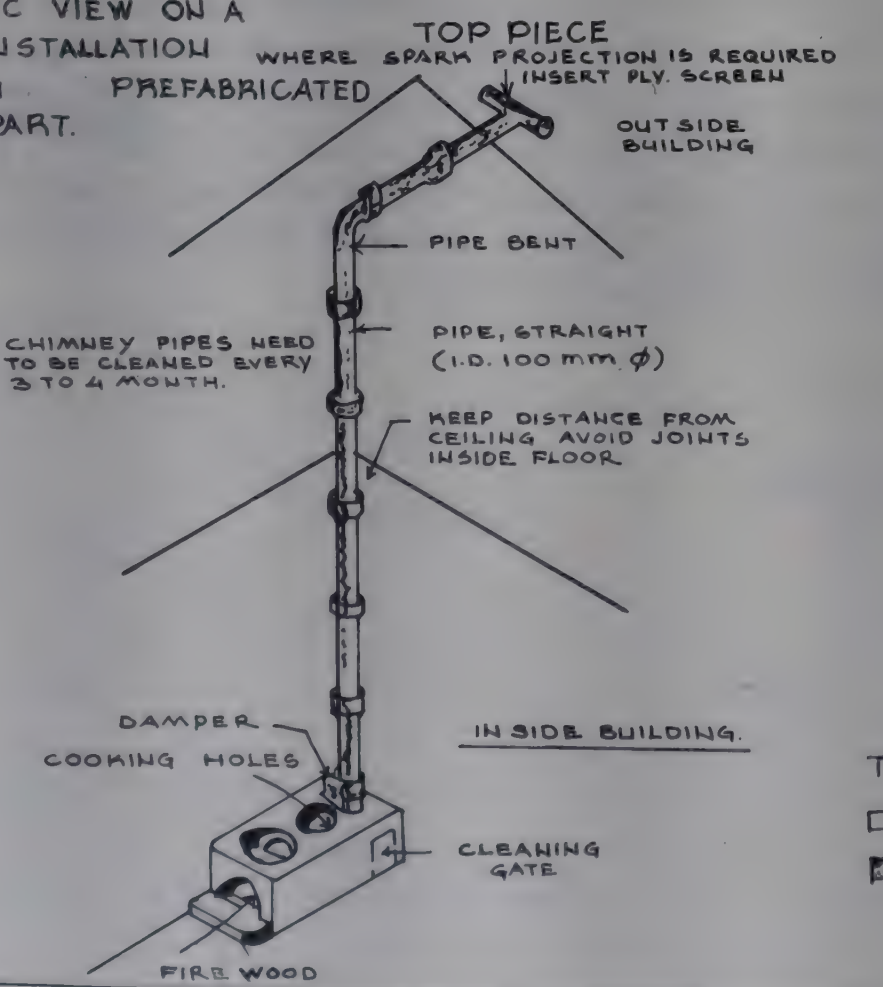




ISOMETRIC AND EXPANDED VIEW ON PREFABRICATED STOVE PARTS BEFORE THE INSTALLATION IN A HOUSE.



ISOMETRIC VIEW ON A STOVE INSTALLATION BY USING PREFABRICATED STOVE PART.



TOP LAYER (3 CM) = CLAY.

BURNED CLAY

BRICK OR STONES.

TECHNOLOGY NO. 51

GANDHI NIKETAN CHOOLA

DESCRIPTION: It is a cheap, durable and light weight model. The different parts of the choola viz., the two single ovens serving as the two pot-seats, the chimney base, the links connecting them, the chimney pipes, the cowlpipes etc., are prepared separately over the potter's wheel (see illustration). Holes are provided on the side walls of the ovens to insert the link-pipes between one oven and another, and the third oven and the chimney pipe. They are then allowed to dry and then baked as earthen pots. The various parts are then assembled and each joint is plastered with mud.

ADVATAGE: The advantage of this type of choola is that it is easily transportable and could be assembled in any convenient place. Wherever it is required as a permanent fixture, the various parts are assembled and plastered on all sides of the floor with clay.

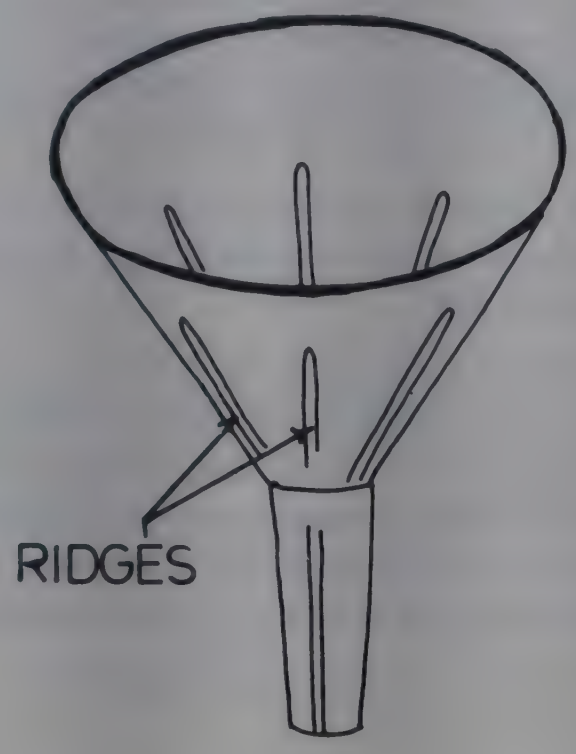
Another important feature is the gradient provided in the flue passage between the two pot-seats. The passage connecting the first pot-seat and the second, has a gradient upto the chimney base. By this design the choola has a better performance, fully utilising the heat units and the smoke entering the chimney base has sufficient heat to raise it (against atmospheric pressure or wind currents) above the roof. There is no tendency to have a back-draft also by this arrangement. It has been found to be cheaper, handy and more purposeful, while maintaining its innate qualities of efficiencey and durability.

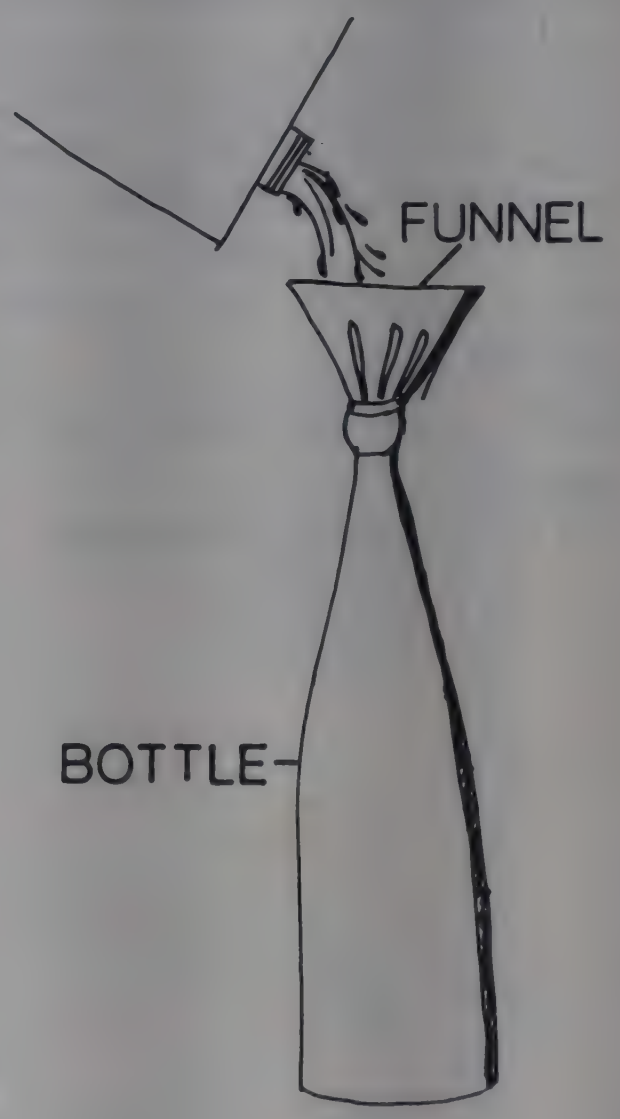
COST : Rs. 50/- (approx.) with chimney

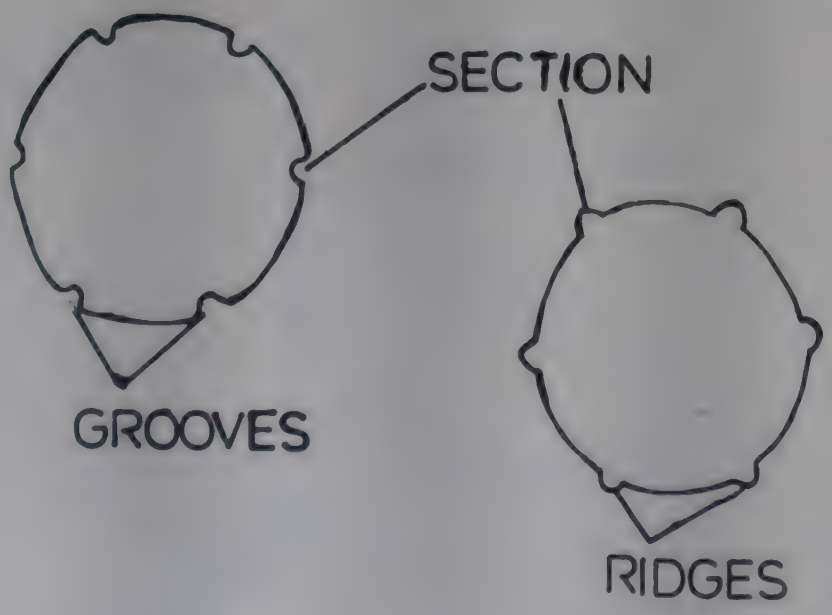
SOURCE : SRI MUNIANDI
GANDHINIKETAN ASHRAM
KALLUPPATTI
MADURAI DIST.
TAMILNADU

03765
COMMUNITY HEALTH CELL
LIBRARY
AND

IMPROVED FUNNEL





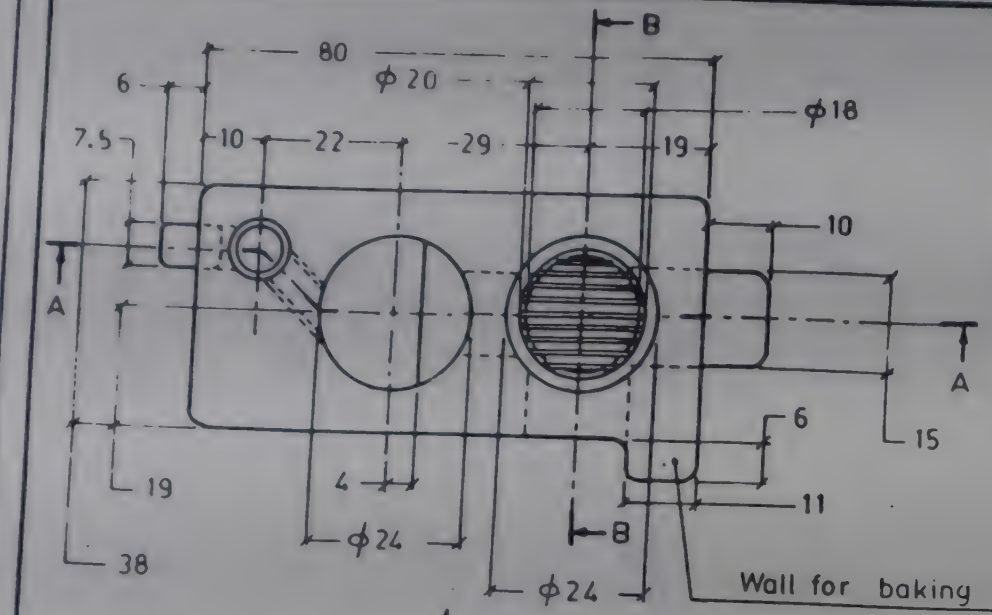


TECHNOLOGY NO. 52

IMPROVED FUNNEL

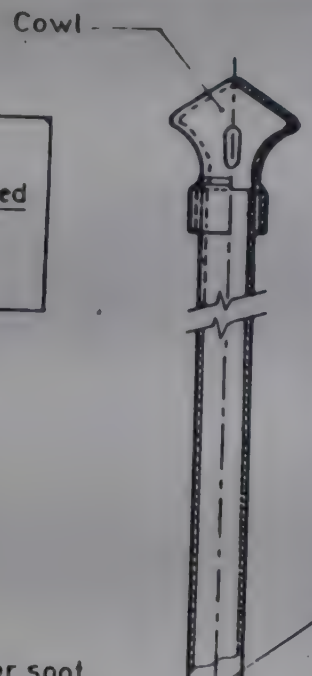
DESCRIPTION : In routine domestic life, it is a common observation that there is practically no gap between the mouth or rim of the bottle and the stem of the funnel. This causes slow intake of the liquid poured because of the entrapped air inside the bottle. This also leads to overflowing of the liquids. This age old problem could be overcome by providing few grooves or a ridge along the periphery of the cone length so that air is pushed out. This feature can easily be incorporated in the moulds.

SOURCE : SHRI N.V. CHANDRASEKHARAN
ELECTRICAL ENGINEER
DEVELLOPMENT CONSULTANT (P) LIMITED,
40 MOUNT ROAD, MADRAS - 600 006
TAMIL NADU

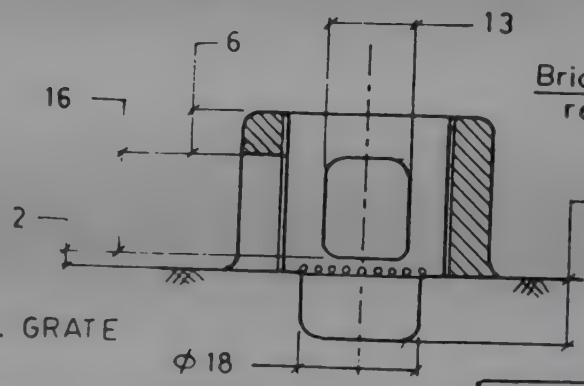


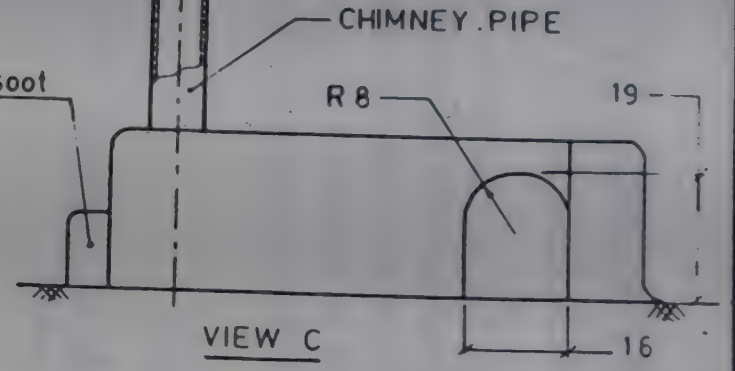
Note :-

1. Unless otherwise specified all dimensions in cm
2. Unspecified Radii R 2

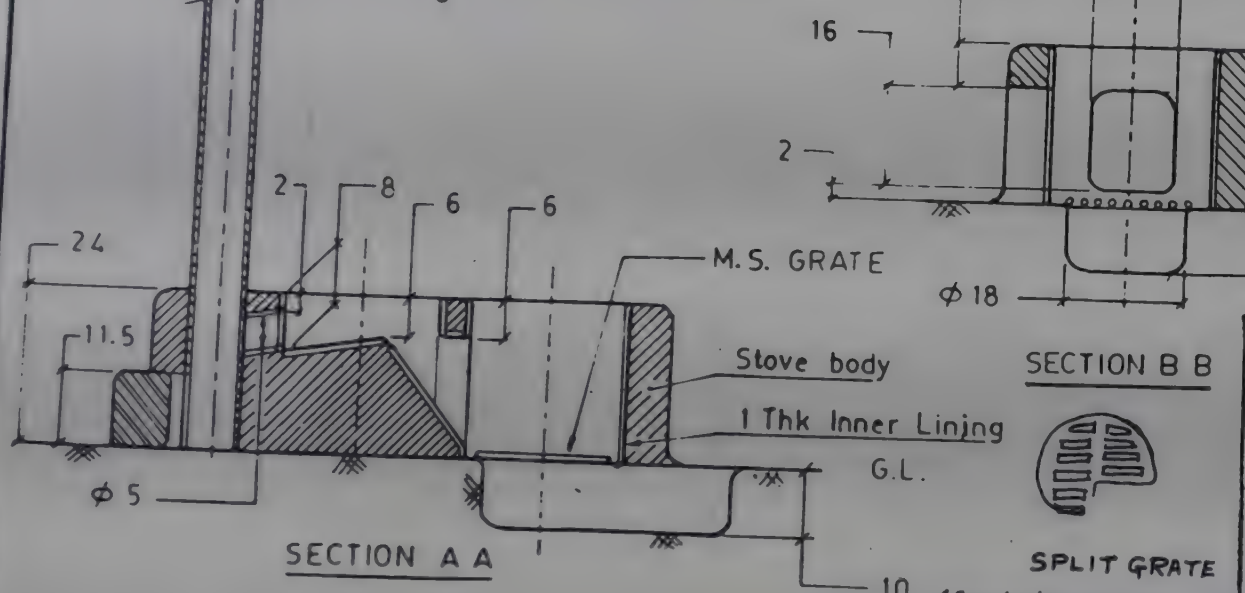


COWL	POTTERY
CHIMNEY PIPE	A.C. PIPE
GRATE	M.S. ROD φ 6mm
INNER LINING	POTTERY
STOVE BODY	CLAY MIXTURE
TUNNEL	A.C./POTTERY
ITEM	MATL





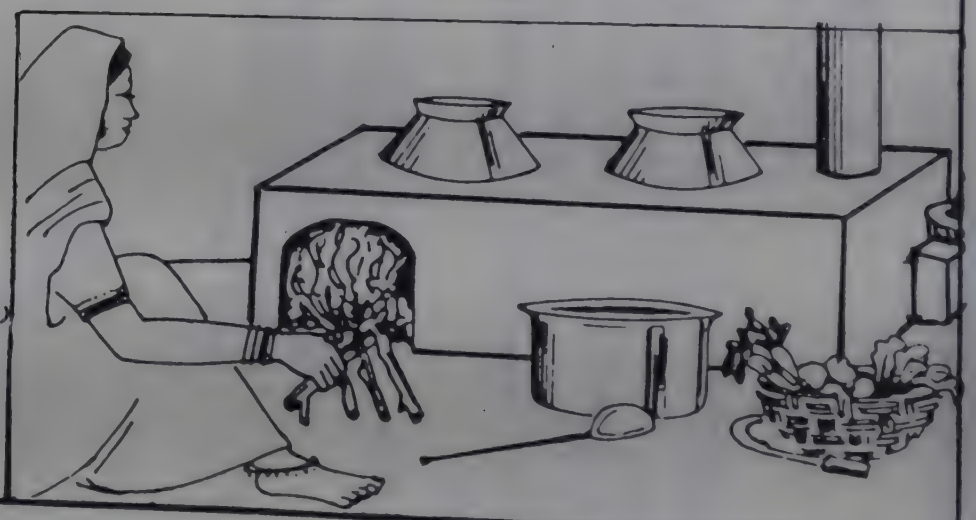
VIEW C



SECTION A A

SECTION B B

SPLIT GRATE
(for baking of chapati)



SUGAM II CHULHA

TECHNOLOGY NO. 53

SUGAM II CHULHA

DESCRIPTION : This chulha is suitable for cooking food for a family of 3 to 8 persons. It is suitable for burning wood (3 to 5 cm dia and 15 to 40 cm long), dung cake and crop residues (including wheat stalk, cotton-stalk and corn cobs etc.)

MATERIALS : i) soft lateritic mud or sandy clay without any pebbles or stones. ii) Pottery lining and a tunnel made of clay. iii) Chimney pipe (7.5 cm inside dia) made of asbestos cement pipe.

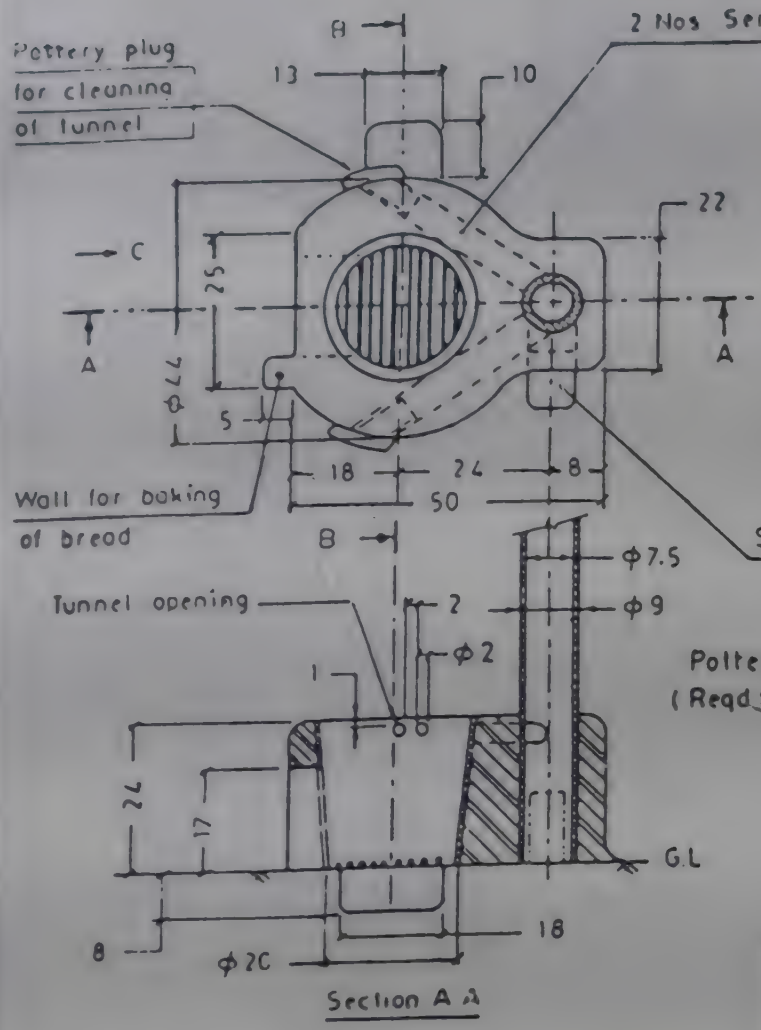
CONSTRUCTION : Take 6 buckets (15 litres capacity) of cleaned mud and mix 2 buckets (15 litres capacity) of of wheat or paddy straw and add water. Knead the mixture to stiff consistency. Allow the mixture to stay overnight before construction of platform of the chulha. Draw the outer dimensions of the platform by appropriately locating the chimney pipe. The platform measuring 80 x 36 x 24 cm is constructed with the clay mixture, prepared earlier. Mark the position of the pot holes, tunnels and chimney pipe on the platform. Fix mild steel grate in the first pot hole at bottom. The respective pot hole openings can be carved out by using a knife. The tunnel adjacent to chimney pipe should be either made of pottery or asbestos cement pipe. Mark hole (12 cm dia) in the roof and take out the chimney pipe. The pipe should project out of the roof between 40 to 60 cm. Allow the chulha to dry for 3 to 5 days and repair the cracks in mud before use.

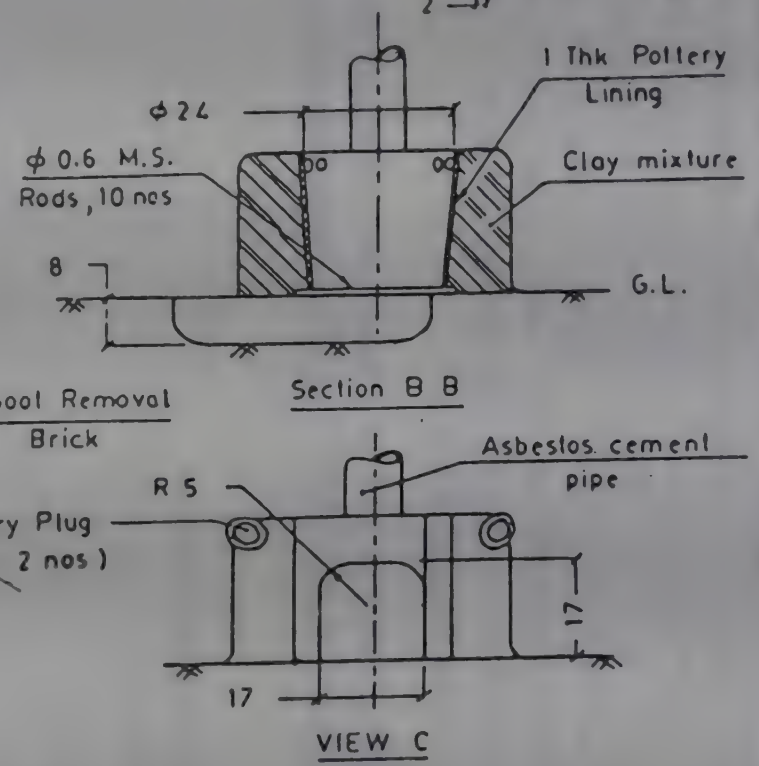
PRECAUTIONS : The chimney tunnel should be cleaned every alternate day by using a brush. Fill up cracks inthe body by using mud as and when they arise. Clean chimney pipe fortnightly.

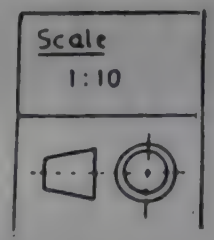
COST : Rs. 65/-

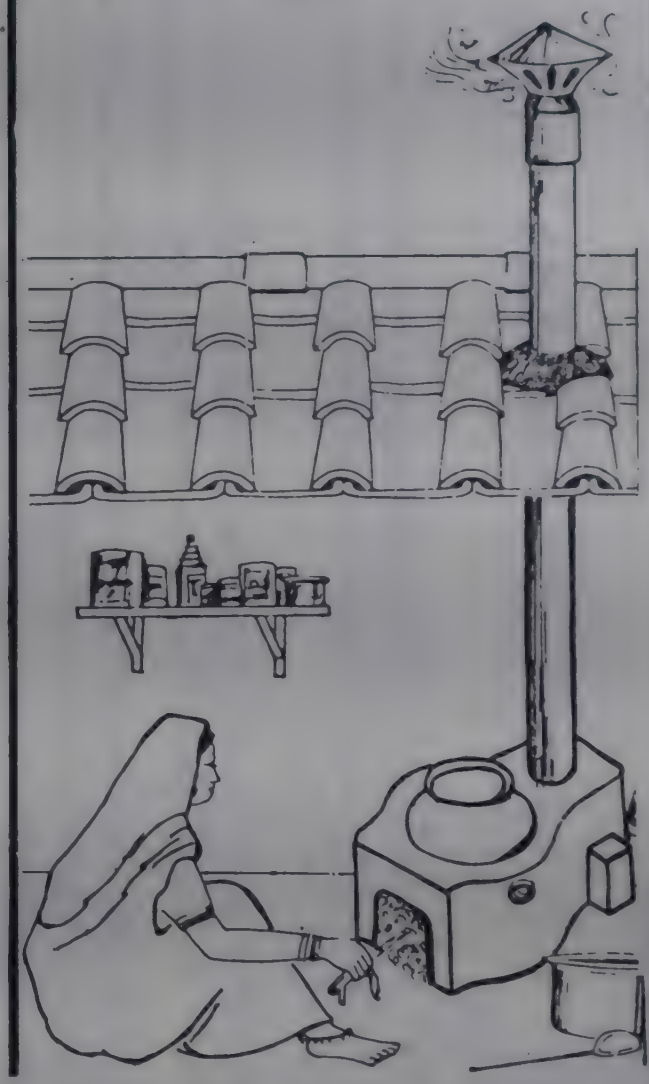
SOURCE : CENTRE FOR RURAL DEVELOPMENT AND
APPROPRIATE TECHNOLOGY
I.I.T. HAUZ KHAS
NEW DELHI - 110 016

PAWAN CHULHA Model - 2









TECHNOLOGY NO. 54

PAWAN II CHULHA

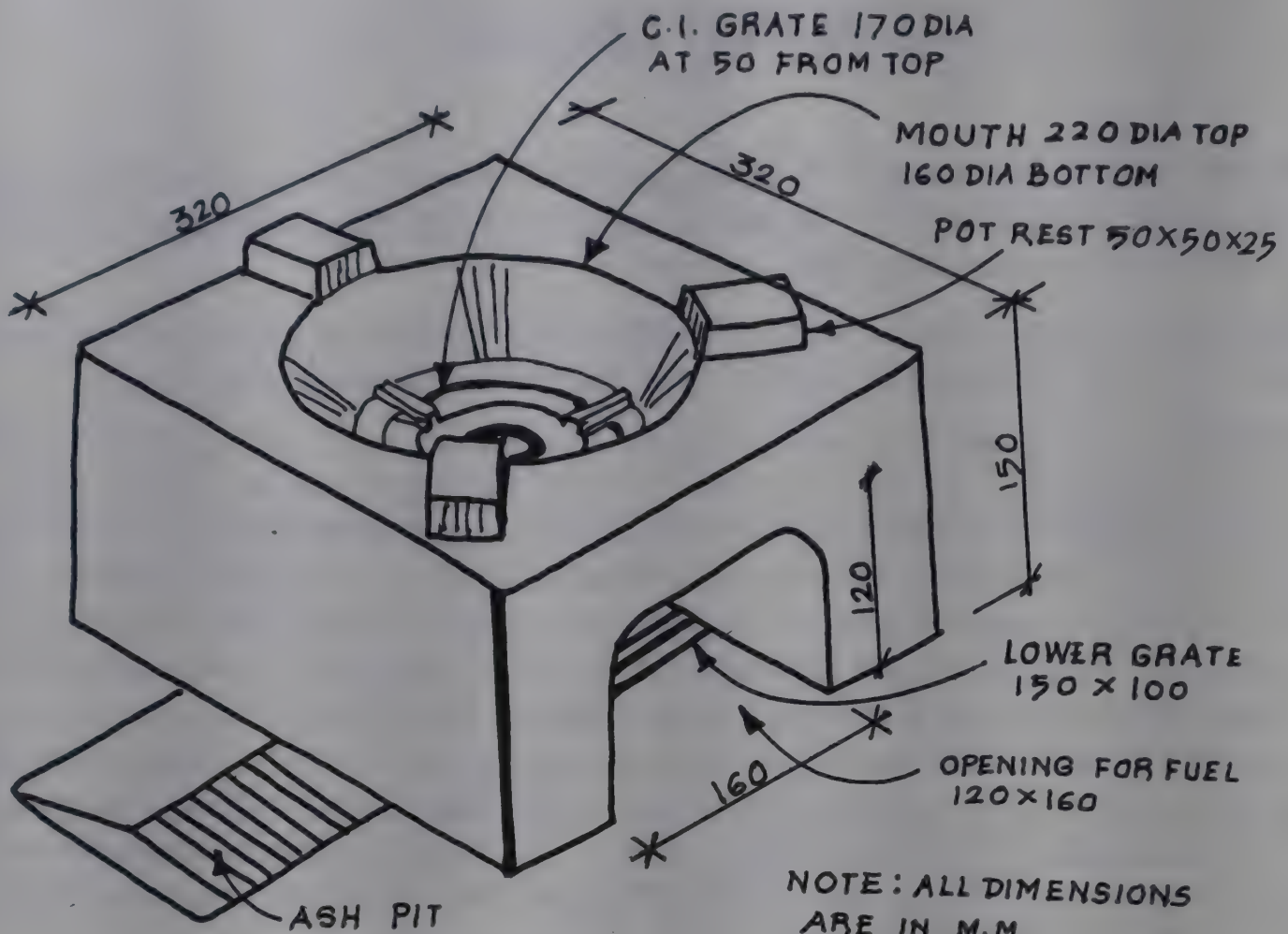
DESCRIPTION : The chulha is suitable for cooking food for a family of 3 to 5 persons. The chulha is suitable for burning wood (3 to 5 cm dia and 15 to 40 cm long), dung cakes and crop residues (including : wheat stalk, cotton-stalk, corn cobs, etc.)

MATERIALS : i) Soft lateritic mud or sandy clay without any pebbles or stones. ii) Pottery lining & tunnel made of clay. iii) Chimney pipe (7.5 cm inside dia) made of asbestos cement pipe.

CONSTRUCTION: Take 4 buckets of mud (15 Litres capacity) and mix it with 1 bucket (15 litres capacity) of wheat or paddy straw and add water. Knead the mixture to stiff consistency. Allow the mixture, to stay overnight for construction of chulha platform. Locate the position of chimney pipe hole in the roof where the chulha is intended to be installed. From the centre point of the proposed hole in the roof find the location of chimney pipe hole at the bottom of the kitchen by using a plumb line. Draw the outer dimensions of the platform (44 x 50 cm) by appropriately locating the chimney pipe. Mark the position of the pot hole using a chalk or marker. Locate the pottery liner, tunnels and chimney pipe on the marked platform. Add clay mixture/prepared-mud to fix the respective position of the liner and tunnels. Carve out ash-removal, opening and soot-removal opening. Fix pottery or mild steel fabricated grate in the first pot hole at bottom. The tunnels are made of asbestos cement pipe or pottery. Make a hole (12 cm dia) in the roofing and take out the chimney pipe. Allow the chulha to completely dry (3 to 5 days) before use.

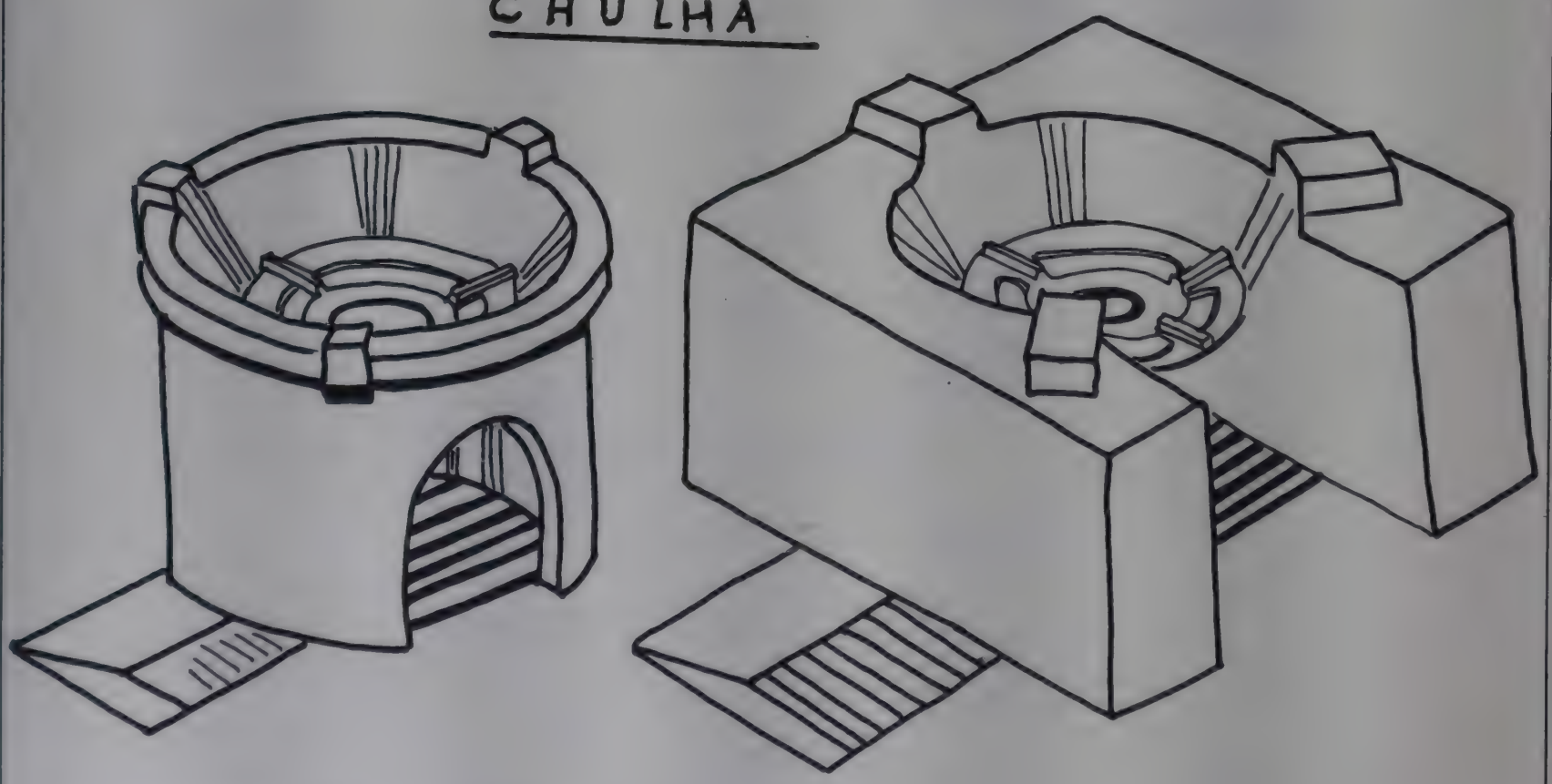
COST : Rs. 55/-

SOURCE : CENTRE FOR RURAL DEVELOPMENT AND
TECHNOLOGY, I.I.T. HAUZ KHAS
NEW DELHI - 110 016



GRAH LAKSHMI

CHULHA



TECHNOLOGY NO. 55

GRIH LAKSHMI CHOOLHA

DESCRIPTION : Grih Lakshmi Choolha is round shaped, pottery lined single pot cooking stove. It is a smokeless, energy efficient (26 to 28%) stove without chimney and damper. Its basic components are two grates and an ash pit.

WORKING : This stove is fabricated using steel or plaster-of-paris moulds. The weight of fired stove is 5 to 6 kg. which is easy to handle and transport. The upper grate helps the flame to spread evenly covering the base of the cooking pot. The lower grate along with the tunnel-like ash pit is designed to create draught which assists efficient burning of cooking fuel and reduces smoke. Ash can be periodically removed from the pit.

COST : Rs. 30/-

SOURCE : CASTFORD,
128/2 J.P. NAIK PATH,
KARVE ROAD, KOTHRUD,
PUNE-441 029
MAHARASHTRA

DURABLE COCONUT LEAF THATCH

FIG. 1

COCONUT LEAVES ARE CUT ALONG THEIR LENGTH.

FIG. 2

RETTING IS CARRIED OUT IN PONDS OR STREAMS.

FIG. 3

PLAITING THE COCONUT LEAVES.

FIG. 4

BRUSHING THE CNSL ON TO THATCH AFTER ITS TREATMENT WITH COPPER SULPHATE.

TECHNOLOGY NO. 56

DURABLE COCONUT LEAF THATCH

DESCRIPTION : Coconut leaf thatch which is a traditional roofing material, has to be renewed each year due to its short life-term. This new technology increases its life from one to four years, saving money, material and labour.

CONSTRUCTION : In the conventional method, when the colour of the leaves turns from green to pale brown then they are sorted out and split along their length after cutting off both the ends (see figure 1). The split leaves are then tied into bundles of about one foot diameter and immersed in water ('retting') for two days (see figure 2). After retting, the leaves are plaited to make thatch sheets (figure 3).

TREATMENT :

1. Dipping and Coating Method

2 Kgs of commercial copper sulphate is dissolved in 200 litres of water in a tank which is 7 feet long, 2 feet broad and 2 feet deep. The dry sheets are immersed in the copper suphate solution for 48 hours and then taken out to dry in the shade. The sheets are then coated with Cashew Nut Shell Liquid (CNSL) on both surfaces with a brush (see figure 4). Only a very thin coating is sufficient for the lower surface of each sheet. The sheets are dried in the sun, after which they are ready for thatching purposes.

2. Spray Method

Mix 7 Kg of CNSL with 1 Kg kerosene and also prepare copper sulphate solution separately by dissolving 2 kg copper sulphate in 200 litres of water.

Spray the copper sulphate solution twice on both sides of 200 dry thatch sheets at intervals of half an hour. The thatches are then stacked one over another, for 24 hours, and dried in the shade. The CNSL is sprayed on both sides of the thatches, with only a thinner coating on the lower surface. The thatches are then dried under the sun and later used for thatching.

PRECAUTIONS : 1. Do not inhale copper sulphate spray since it is toxic. 2. Be careful while spraying kerosene as it is a fire-hazard.

COST : a. Cost of thatching per square metre by dipping and coating method is Rs. 10.25
b. Cost of thatching per square metre by the spray method is Rs. 8.10

SOURCE : C.K.S. PILLAI,
R.R.L (CSIR),
TRIVANDRUM - 695 019
KERALA

RED CLAY NON-ERODABLE TILES

PREPARING THE TILES

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2 3

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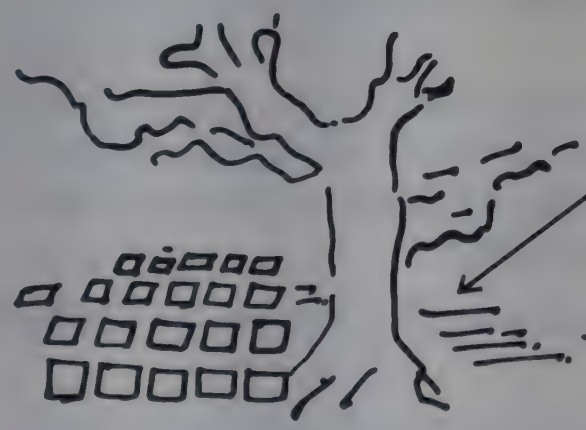
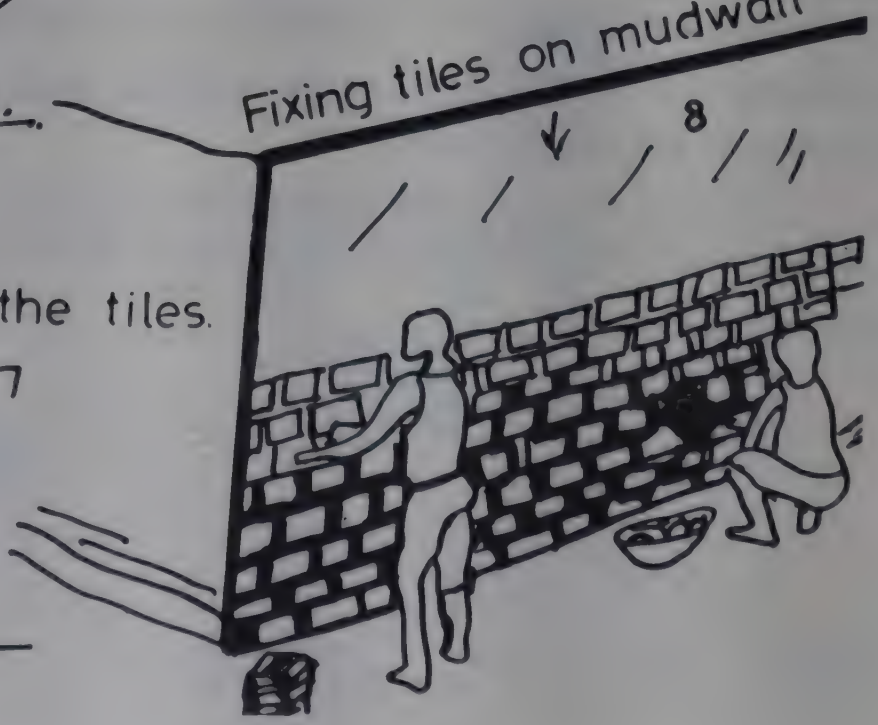

Drying tiles in the shade.

Fixing tiles on mudwall

8



Firing the tiles.

7

TECHNOLOGY NO. 57

RED-CLAY NON ERODABLE TILES

DESCRIPTION : This is an effective technology to protect mud walls from erosion during the rains and damage due to cattle, rodents and bullock-carts by utilizing baked clay wall-tiles. This technology comprises preparation of (6″x6″x5/8″) baked clay tiles, which are fixed on the mud walls to create an impermeable barrier to the rain.

CLAY PREPARATION : Take the local clay and put it in a tank and allow it to soak overnight. Then prepare clay-slurry by mixing it with hands and feet. Pass this clay slurry through a 10 mesh metallic net and collect it in a settling tank. In this tank, along with clay-slurry add grog (low-burnt black cotton soil) and ash and allow the mix-slurry to dry. This whole process takes 3 days, after which knead the clay with feet (Figure 1).

TILE MAKING : Take a squarish metallic frame of 6.5″x6.5″ sides and a thickness of 6/8″ for the tile formation. Place this frame over the plain surface and sprinkle ash or brick powder on it. Throw some prepared clay into the cavity of this mould and ram it thoroughly (Figure 3). Cut off the excess clay (above the frame - level) with an iron wire (Figure 4). Sprinkle water on the iron, the top surface and do the finishing (rubbing) with a wooden strip (Figure 5). Remove the metallic frame and allow the tiles to dry for a day in the shade.

Provide proper finish to the edges the next day and turn the tile upside down and put it inside the frame. Now make deep, sharp horizontal grooves on this upturned bottom to acquire a good grip on the mud wall, (Figure 6), and remove the frame with a bent knife.

TILE BAKING : Pile up the tiles in tens, one over another, and place a weight on top of each pile to prevent warping. Spread them out in the sun to dry for another day. Load 1500-2000 of them in an updraft kiln of a potter (Figure 7) and fire the kiln to reach a temperature of 880°C celsius. Unload these tiles the next day as they are now ready for use.

TILE FIXING : Scrap the outer coating of the mud wall to acquire a rough surface for getting a good hold on the tiles. Take good quality soil for preparing the mud mortar and sieve it. Mix the mud-mortar with 5% fibrous material like wheat husk, straw etc., and keep it up to 4-5 days for aging (Figure 8). Mix the mud mortar thoroughly and apply a 2 to 3 inch thick layer of plaster over the wall surface. Correct the deformations on the wall while plastering to make the surface straight and smooth (Figure 9). Take the precaution of maintaining a slope of 5 to 6 inches from the bottom to the top level of the wall, while plastering it (Figure 10).

Select only the strong and well-shaped tiles, rejecting half-burnt and cracked tiles, for fixing on the wall.

Then press the clay tiles well into the wall (coated with mud and mortar) with the grooved side embedded in the mud mortar. Remove the mud mortar which is pressed out from between two adjacent tiles and fill up the gap between them with cement mortar (Figure 12). Take one portion cement and four portions of sand for this purpose. Cure this cement pointing for 4-5 days.

Contd. on page no. 115

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WATER

18.

NON ERODABLE
RED CLAY TILES.

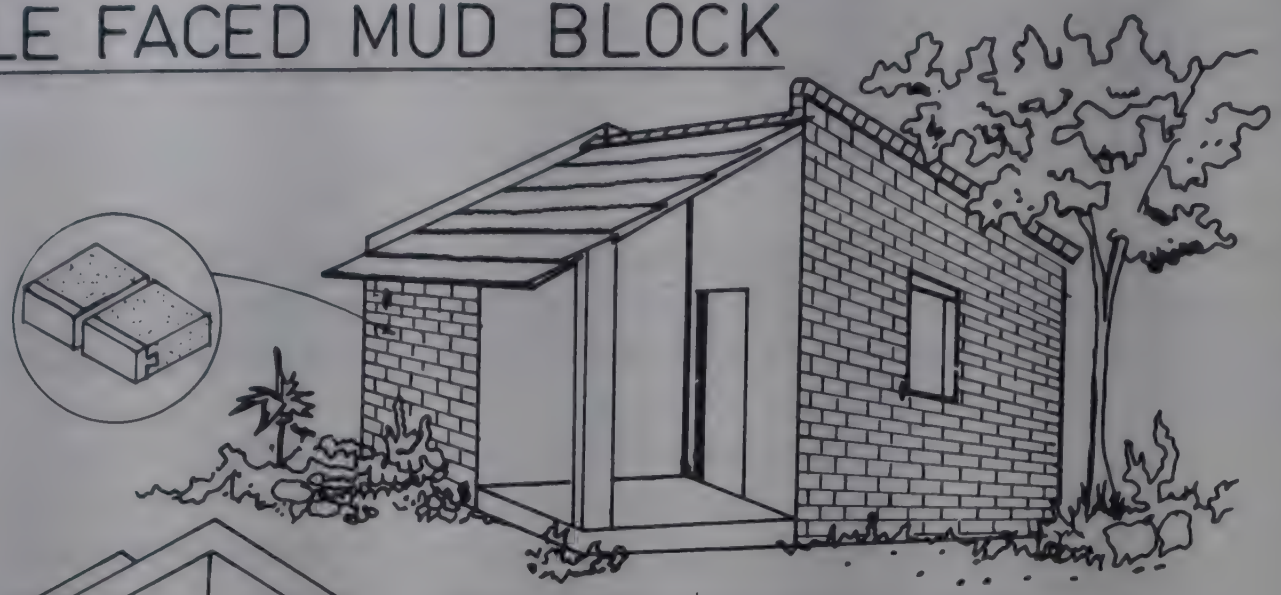
1. The roof above the wall to be tiled must not leak and it should have a sufficient overhand (Fig. 13).
2. For Successful application of the tiles, it is essential to select stable walls like thick cob walls or wattle and daub walls whose frame is strong and well-fixed. The thickness of the wall should not be less than six inches (Figure 14).
3. Each row of tiles should be slightly shifted from the row below, so as to procure a strong bond (Figure 15).
4. To avoid seepage of water, during the monsoon, dig up the soil around the base of the wall and fix the tiles slightly under the ground. Put stones under the tiles at the base and cover the last tile with soil. A small embankment resembling a step, should be constructed all around the house and plastered with "Gobri" to protect the plinth (Figure 16.).
5. The last row of top tiles should smoothly merge into the wall above it. To facilitate this, the wall just above the row of tiles should be grooved and a joint of cement or a row of half tiles be fixed in one wall at an angle, thus joining the edge of the top tiles with the wall. After the tiles are fixed, the wall above the tiles surface should be replaced with mud mortar to a thickness that the tiles and mud wall come to the same level, forming an even surface with no slope or groove. (Figure 17).
6. To save the corner joints from physical abrasions (caused by animals or bullock-carts) either the tiles have to be cut into two pieces and a round corner made or the tiles should be joined in a manner so that they make a strong and perfect right angle. (Figure 18).

COST : It costs around Rs.2/- per square feet with labour and it costs about Rs.1.25 per square feet if the owner does all this work himself/herself.

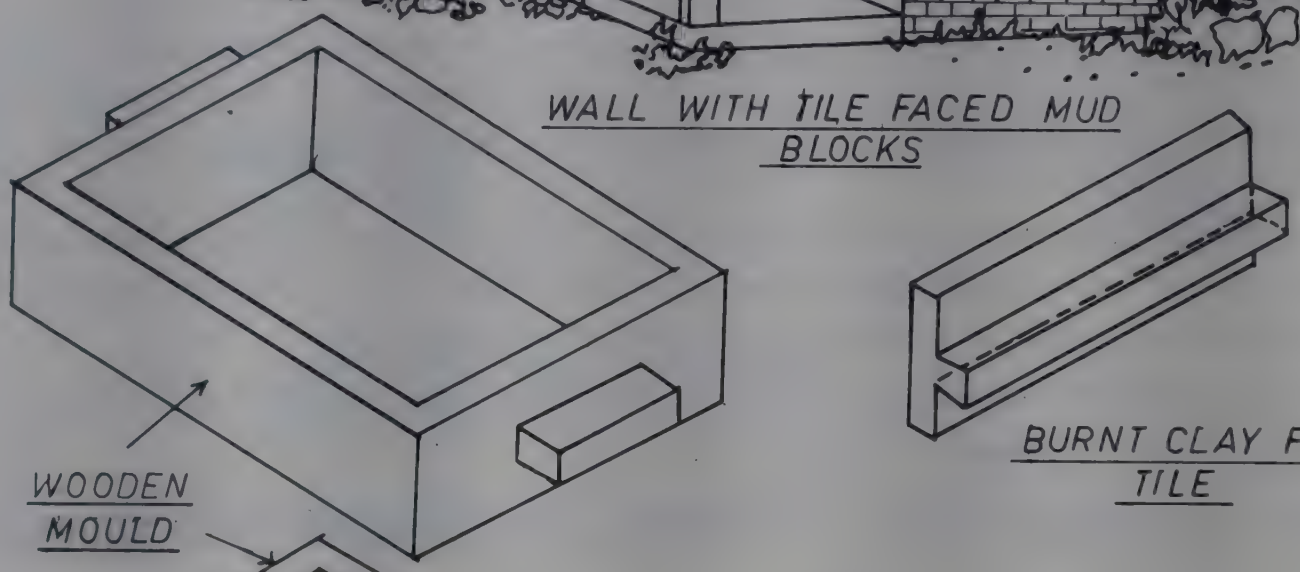
ADVANTAGE : These tiles have a lifespan of 5 to 10 years, dependinng upon their maintenance.

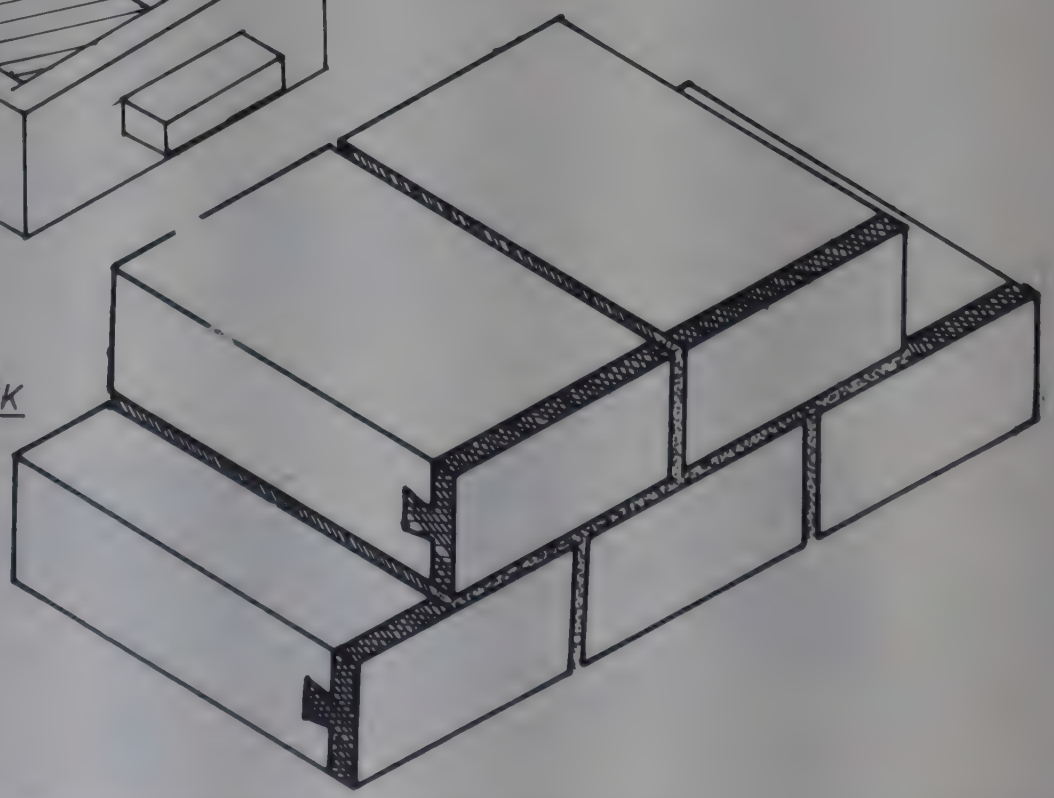
SOURCE : CENTRE OF SCIENCE FOR VILLAGES
MAGAN SANGRAHALAYA
WARDHA 442 001
MAHARASHTRA

TILE FACED MUD BLOCK



WALL WITH TILE FACED MUD BLOCKS





TILE FACED BLOCK

TECHNOLOGY NO. 58

TILE FACED MUD BLOCK WALL

DESCRIPTION : The wall consists of sun-dried mud blocks having burnt clay tiles facing the exterior. The face-tile provides the protection to the mud wall from rain and rodents. Flat tiles have a key (holding notch) on the back side. Wet mud, on drying, grips the key thus making the tile an integral part of the mud block. The blocks are laid in mud mortar and joints (on drying) are sealed with cement pointing (Fig. 1).

CONSTRUCTION : The tiles of the dimension 9 inch x 4 inch x 0.5 inch, provided with a holding notch at the posterior, are prepared by using local soil with the help of wooden moulds. Non-skilled women labourers can prepare 200-250 tiles every day with 15 days practice. (Fig.2).

These tiles are fired in pottery oven at a temperature of about 900 degrees centigrade. Each tile is then placed in a wooden mould (9 inch x 9 inch x 4 inch) (Fig. 3).

Rest of the mould is filled with mud, prepared from a local soil mix (Fig. 4). The mud blocks, thus prepared, hold the tile even after drying (Fig. 5). About 100 mud blocks can be prepared per day by a semi-skilled female. The strength of the block is noted to be about 15 Kg per square centimetre.

The mud blocks used for wall construction must be joined with mud mortar only. The blocks are so arranged that the tiles face the exterior. The gaps between the tiles are pointed with a cement mortar.

ADVANTAGES :

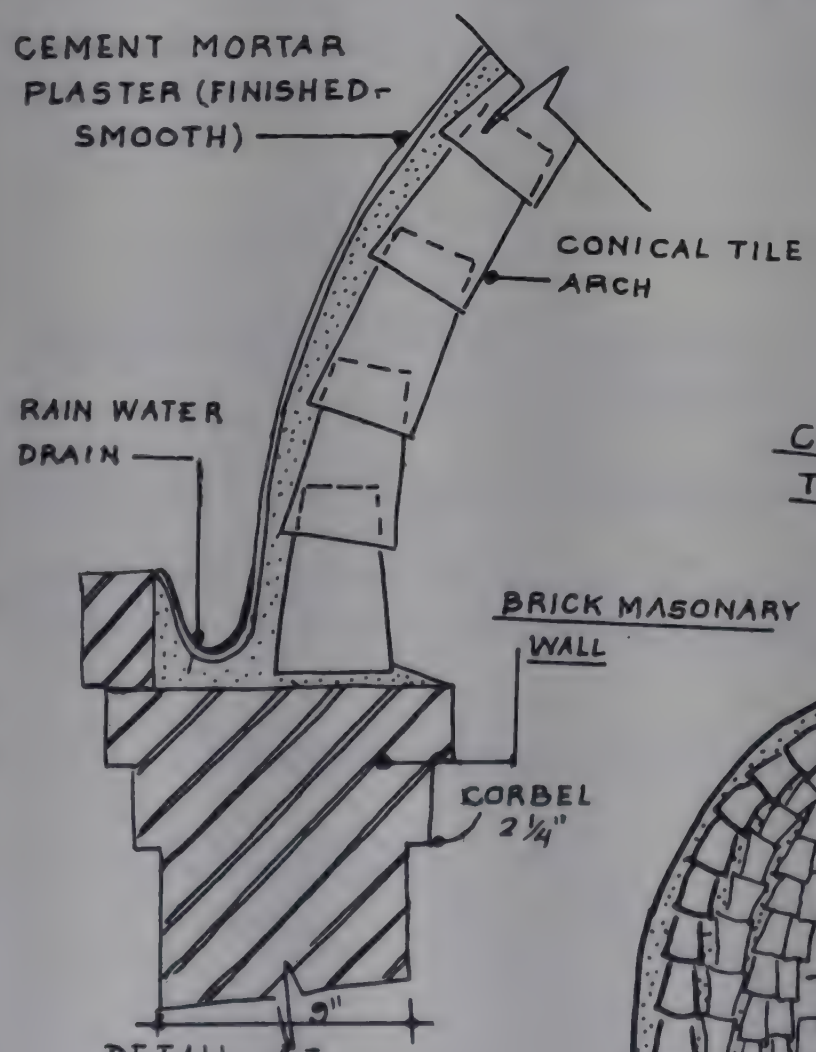
- This wall is cheaper than the burnt brick wall.
- Uses locally available materials.
- Simple and fast construction compared to conventional mud walls and burnt brick wall. Is highly labour intensive and mainly utilizes unskilled labour.
- Suitable for self-help mode of construction.
- The larger mass provides better insulation, making the dwelling climatically more suitable.
- Requires minimal annual maintenance.
- The use of energy-consuming materials, namely the face-tile and the cement for pointing, is limited to the exterior half-inch of the wall, instead of the full depth, thus drastically cutting down the energy needs of the wall.

COST : Each tile costs 25 paise. A tile-faced mud wall will cost Rs. 3/-per cu. feet.

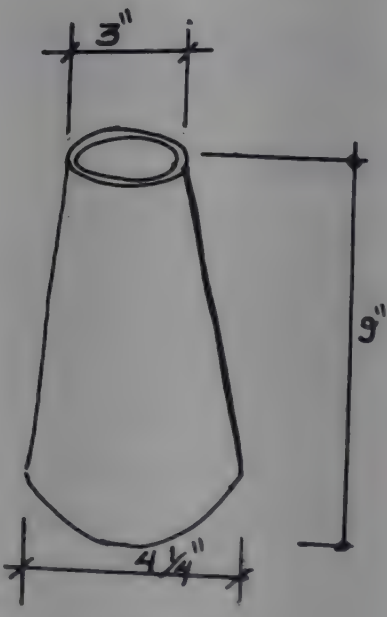
SOURCE : CENTRE OF SCIENCE FOR VILLAGES
MAGAN SANGRAHALAYA
WARDHA - 442 001
MAHARASHTRA

CONICAL TILE ARCH ROOF

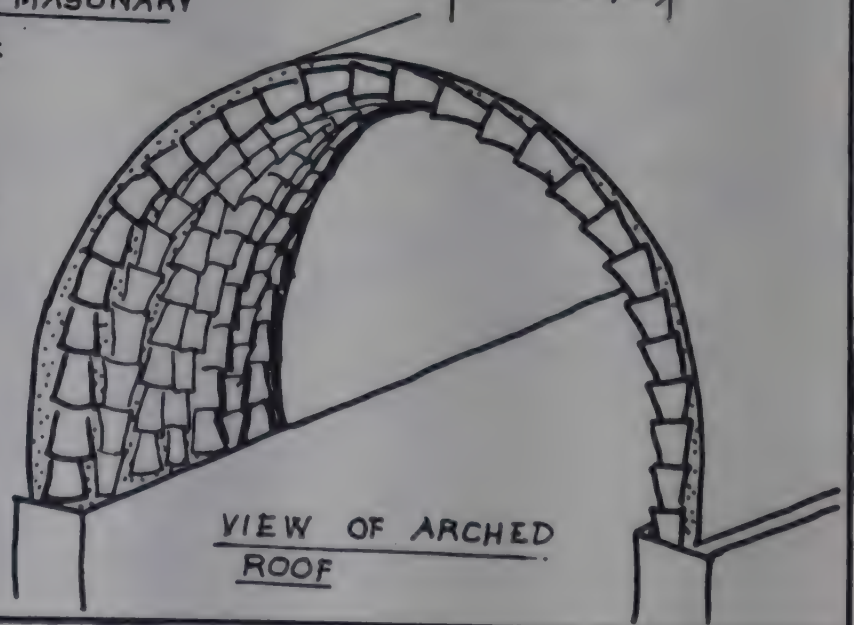
PERSPECTIVE VIEW



DETAIL AT SPRINGING POINT



CONICAL TILE



VIEW OF ARCHED ROOF

TECHNOLOGY NO. 59

BURNT CLAY TUBE ARCH ROOF

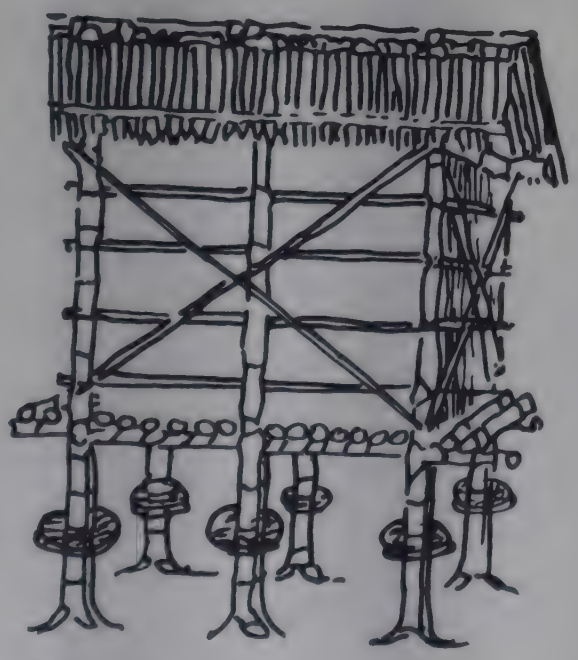
DESCRIPTION : This roof consists of a series of arches made out of tapering burnt clay tubes inserted into one another and plastered with cement mortar from the outside to make it water-resistant.

ADVANTAGES : Requires minimal annual maintenance; Long lasting; Does not use wood or steel and uses minimum amount of cement; Simple and fast construction using predominantly village-based materials with the exception of cement; 60% village economy component in the total cost of construction; provides much needed work to the village potter; The air in the hollows of the arches provides good insulation, making the house climatically more suitable.

COST : The roof costs approx. Rs. 30.00 per square ft.

SOURCE : CENTRE OF SCIENCE FOR VILLAGES
MAGAN SANGRAHALAYA
WARDHA - 442 001
MAHARASHTRA

PROTECTION FROM RODENTS



Bamboo poultry house

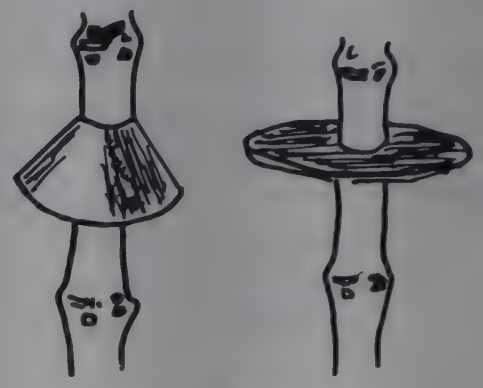
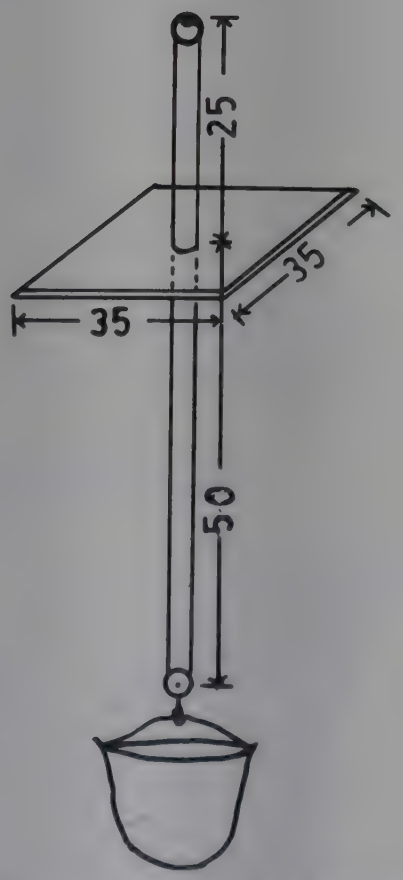


FIG. 1



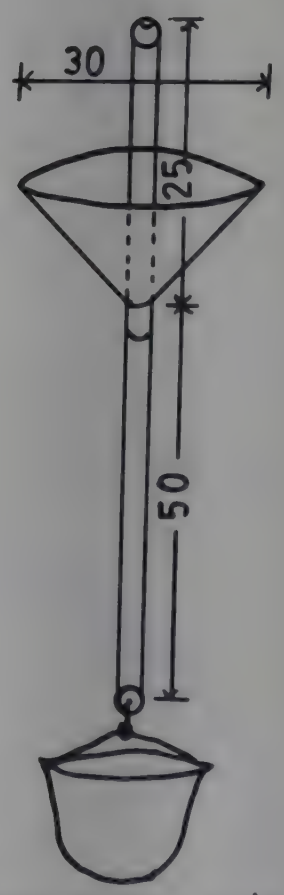


FIG. 2 Square & funnel-shaped barrier.

TECHNOLOGY NO. 60

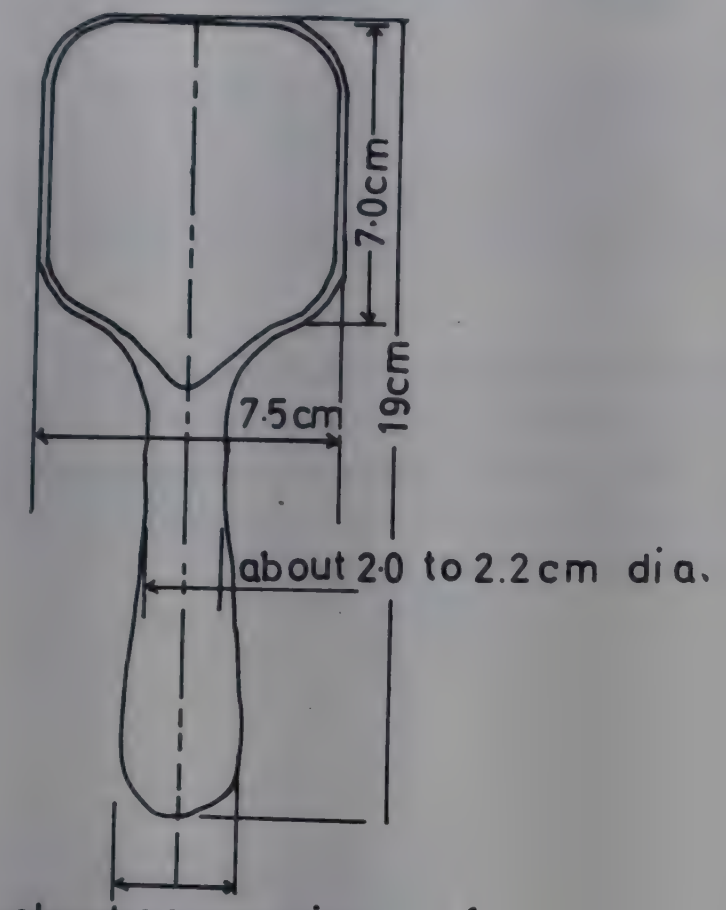
PROTECTION FROM RODENTS

Food losses and health hazards caused by rodents are a problem in Rural India and the chemical methods pose a grave threat to the human health. Hanging food from the roof in pots or baskets is a traditional method used by rural women, but it is a failure since rats can not be stopped this way. Hence, the following simple and effective technology keeps rodents at bay as they are unable to reach the food.

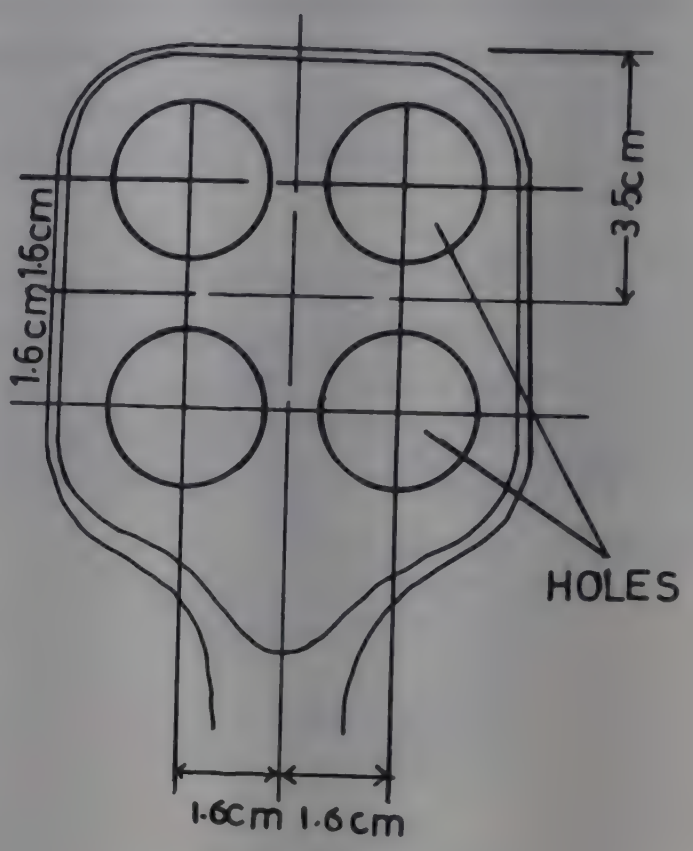
CONSTRUCTION : Sqaure and funnel-shaped barriers can be erected (as shown in Figures 1 & 2). A metal barrier fixed to the rope or stick from which the basket is hung can keep the rats out because they are unable to climb around it. The rats are not able to cross a barrier with a radius over 18 cm and are not able to jump distances more than 70 cm vertically, and 80 cms horizontally, to reach the basket. The distance between the roof and barriers should be at least 25 cms.

SOURCE : YASHODA L. URS
INFESTATION CENTRE AND
PESTICIDE DISCIPLINE
CFTRI
MYSORE - 570 013
KARNATAKA

WOODEN MAIZE SHELLER



1



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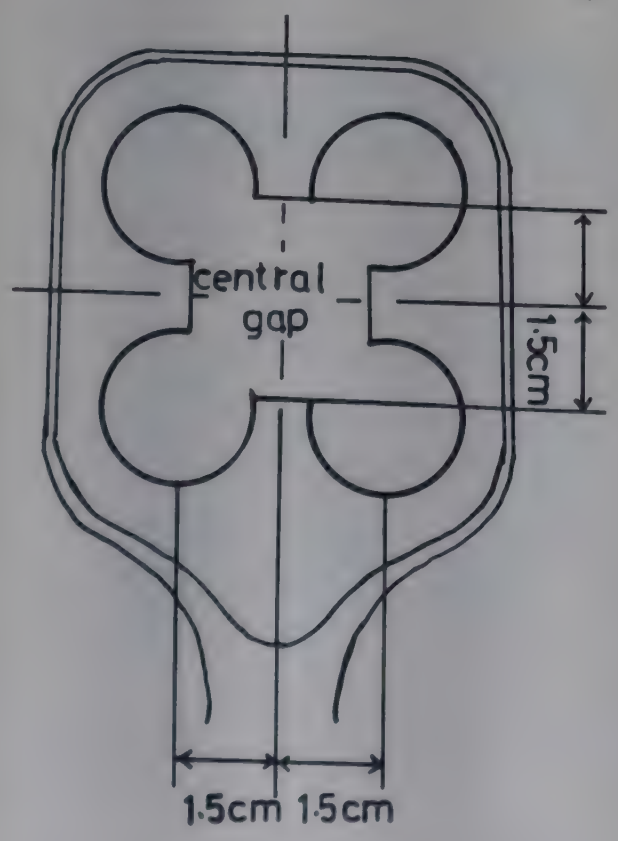

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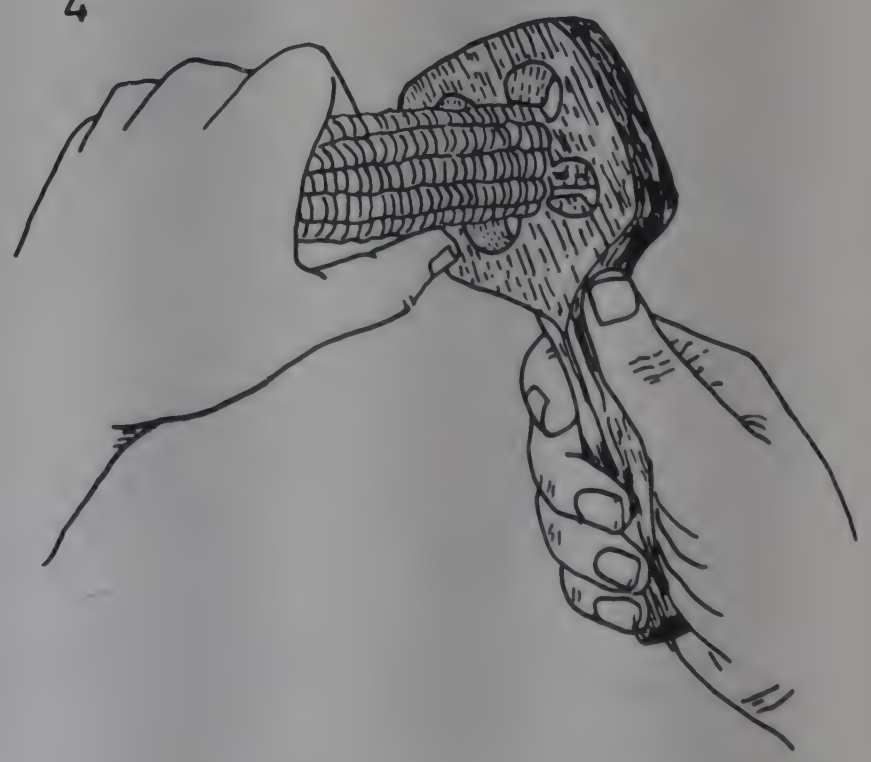


SHELLING MAIZE COB

TECHNOLOGY NO. 61

WOODEN MAIZE SHELLER

DESCRIPTION : The Wooden Maize Sheller is an effective hand sheller which is not only economical but also reduces the drudgery of rural women who have to undergo the hectic task of removing the grain by holding the cob in one hand and detaching the corn with the movement of the thumb by wrist action.

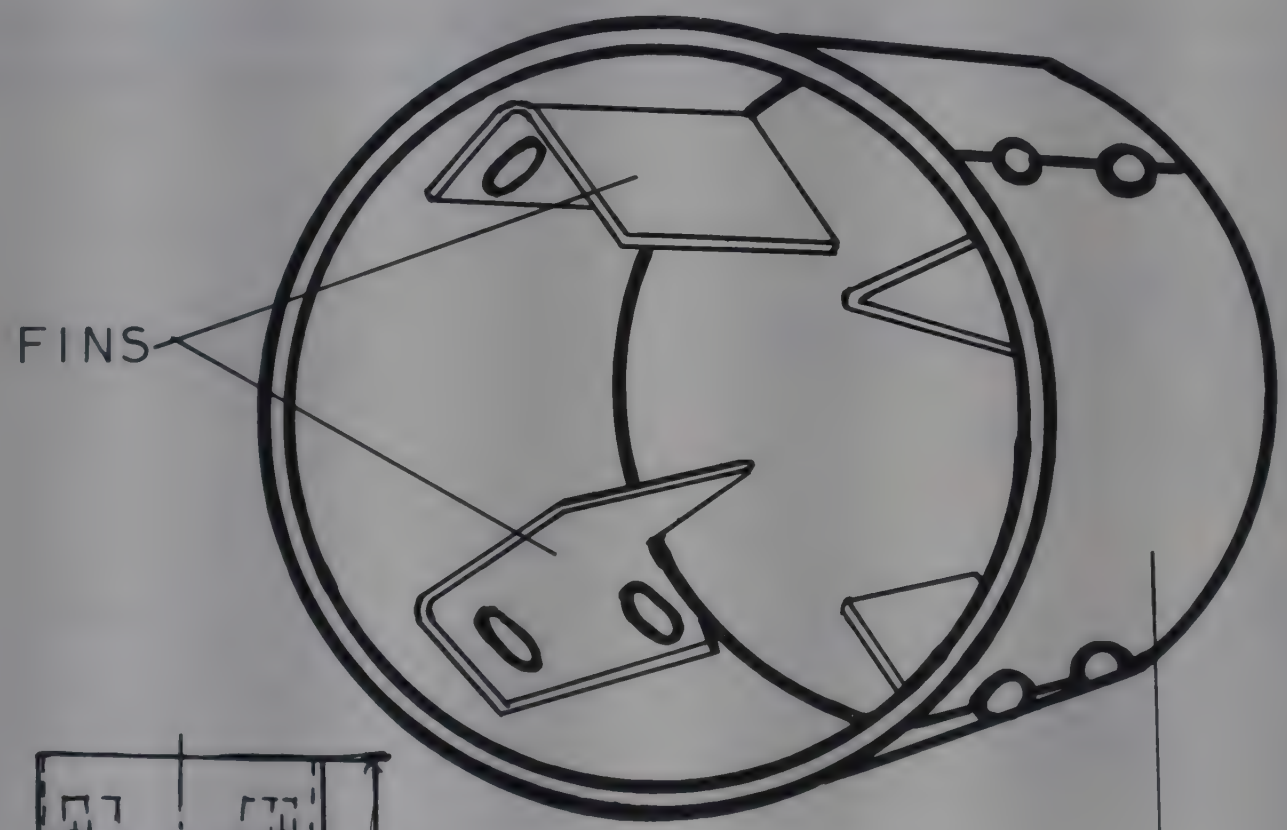
CONSTRUCTION : The wooden sheller is constructed out of a wood which is 20 cm long, 7.5 cm wide and 2.8 cm thick. Shape a 12 cm long handle at one end. Drill 4 holes of a uniform 2.2 cm diameter at the other end. Keep a distance of 3.2 cm between the centres of any hole and the adjoining one. Remove the middle portion between the holes to formulate a square gap of 3.1 cm side.

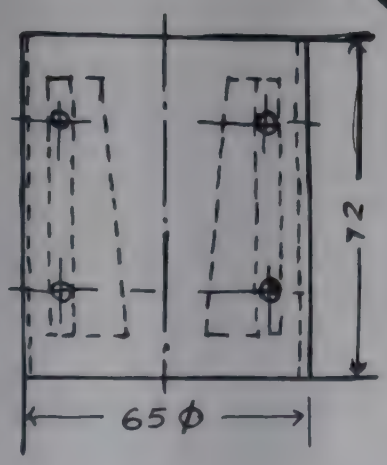
WORKING : Hold the sheller in one hand and pass the maize cob into the empty space between the holes. Rotate the cob to shell the corn. Different sized cobs may require shellers with varying central gaps.

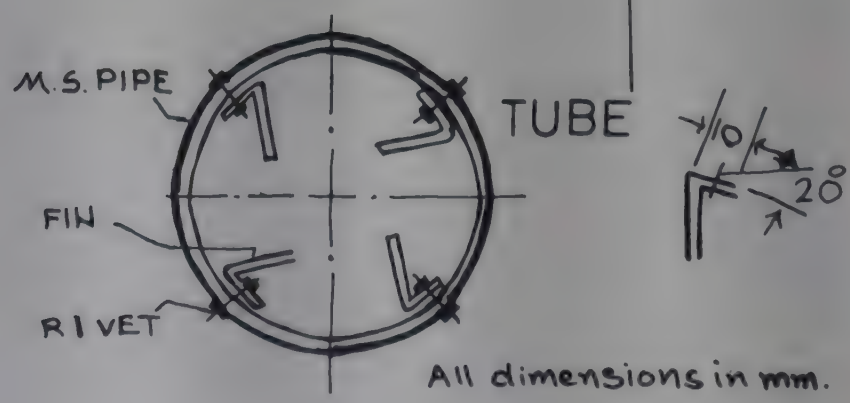
COST : Rs. 15/-

SOURCE : GRAHAM PINSON
TROPICAL PRODUCTS INSTITUTE
INDUSTRIAL DEVELOPMENT DEPARTMENT
CULHAM, ABINGDON
OXFORDSHIRE OX 14 3 DA
UNITED KINGDOM

TUBULAR MAIZE SHELLER







All dimensions in mm.

TECHNOLOGY NO. 62

TUBULAR MAIZE SHELLER

DESCRIPTION : The Tubular Maize Sheller is one of the most appropriate hand-shelling tools available presently. It has an efficiency of more than 99 percent and hence, a boon for the rural women.

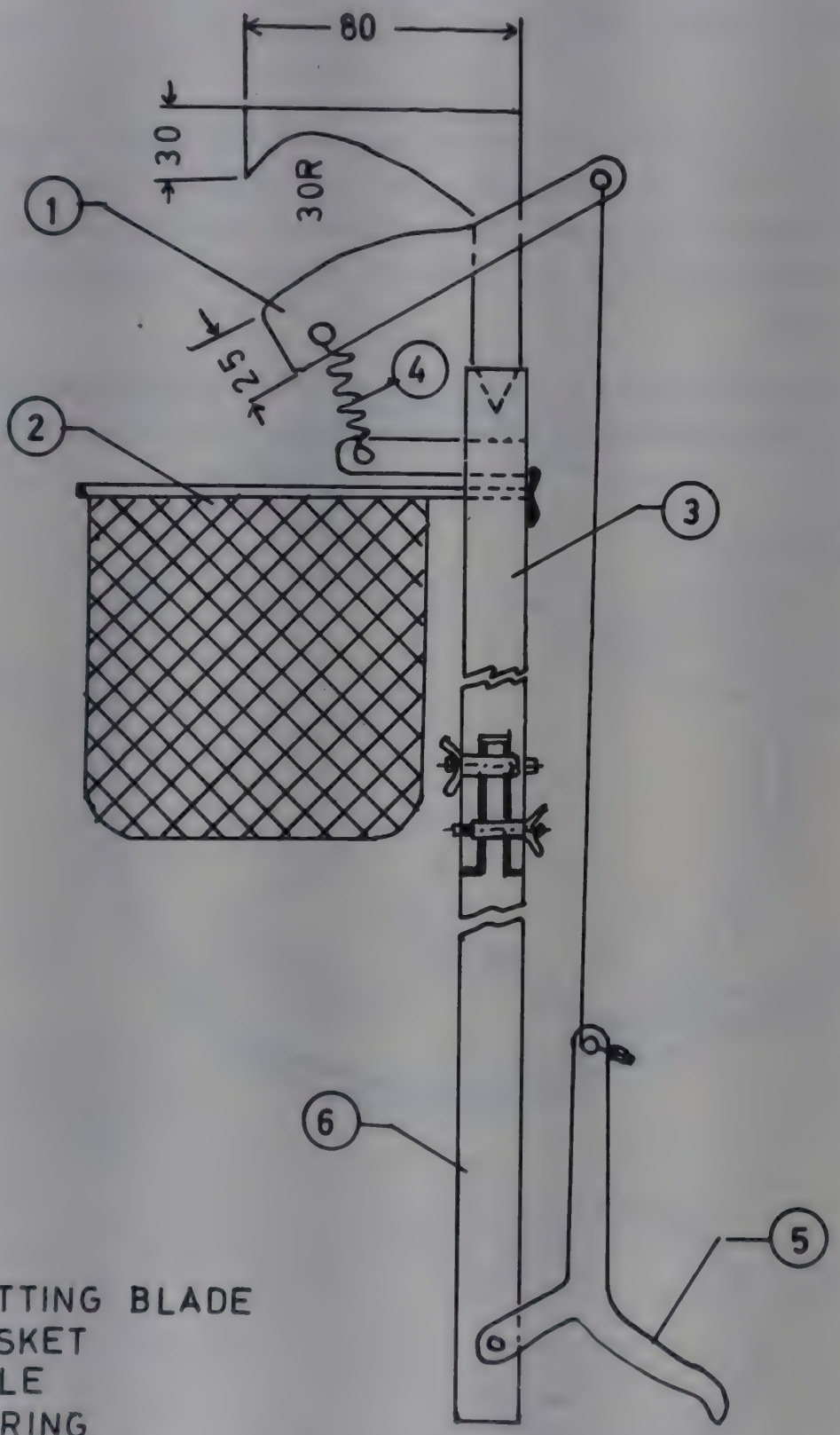
CONSTRUCTION : This sheller is constructed out of a small mild steel pipe of 16 gauge sheet and a diameter of 62.5 mm. There are four fins attached on the inside wall. These fins are made out of a 18 gauge mild steel sheet and bent at 70 degrees. They are tapered at their ends to provide two different openings. At one side the opening is 26.5 mm while it is 39 mm at the other end. This facilitates shellings cobs of varying sizes.

WORKING : Hold the sheller in one hand and insert the cob with the other. Rotate them in different directions. The fins detach the corn from the cob at the rate of about 20 kgs an hour.

COST : Rs.10/- (approx.)

SOURCE : CENTRAL INSTITUTE OF
AGRICULTURAL ENGG (ICAR)
SHRI GURU TEGH BAHADUR COMPLEX
BHOPAL - 462 003
MADHYA PRADESH

FRUIT HARVESTING DEVICE



1 CUTTING BLADE
2 BASKET
3 POLE
4 SPRING
5 OPERATING HANDLE
6 EXTENSION POLE

DIMENSIONS IN M.M.

TECHNOLOGY NO. 63

FRUIT HARVESTING DEVICE

DESCRIPTION : This manually operated fruit harvesting device works on the principle of individual cutting of fruit by the blade and collecting the fruit in the basket.

CONSTRUCTION : A long metal rod or a bamboo pole is taken, to one end of which is fitted a blade with a spring attachment. The other end of the blade is connected to the operating handle with a rope. A basket is fixed just below the cutting blade.

WORKING : The long rod is raised up and the fruit (to be cut) is dangled between the two blades. On pressing the operating handle down, the rope is pulled down, in return causing the blade to cut the fruit which falls straight into the basket. The spring arrangement snaps the blade back into the original position so that the whole process could be repeated again with the next fruit.

COST : Rs.25/- (approx.)

SOURCE : DEPARTMENT OF AGRICULTURAL ENGINEERING
ASSAM AGRICULTURAL UNIVERSITY
JORHAT 783 013
ASSAM

THE DIXIE BAG

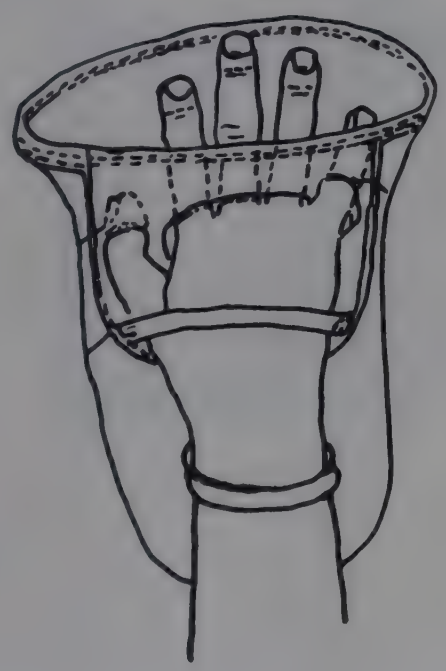


FIG. 1

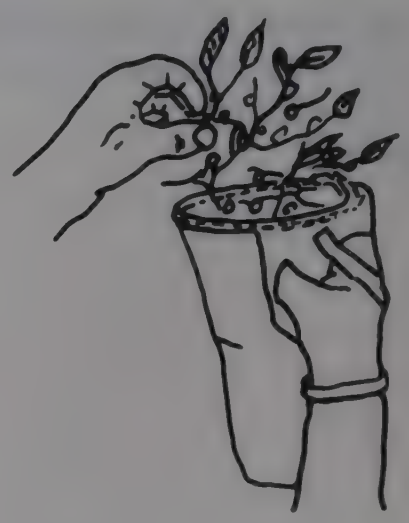


FIG. 2

TECHNOLOGY NO. 64

THE DIXIE BAG

DESCRIPTION : The Dixie Bag is a simple hand-harvesting kit to increase the speed and effectiveness of the rural women engaged in picking fruits, nuts or coffee beans. Rural women can earn more money as they can pick more fruits in less time with great ease.

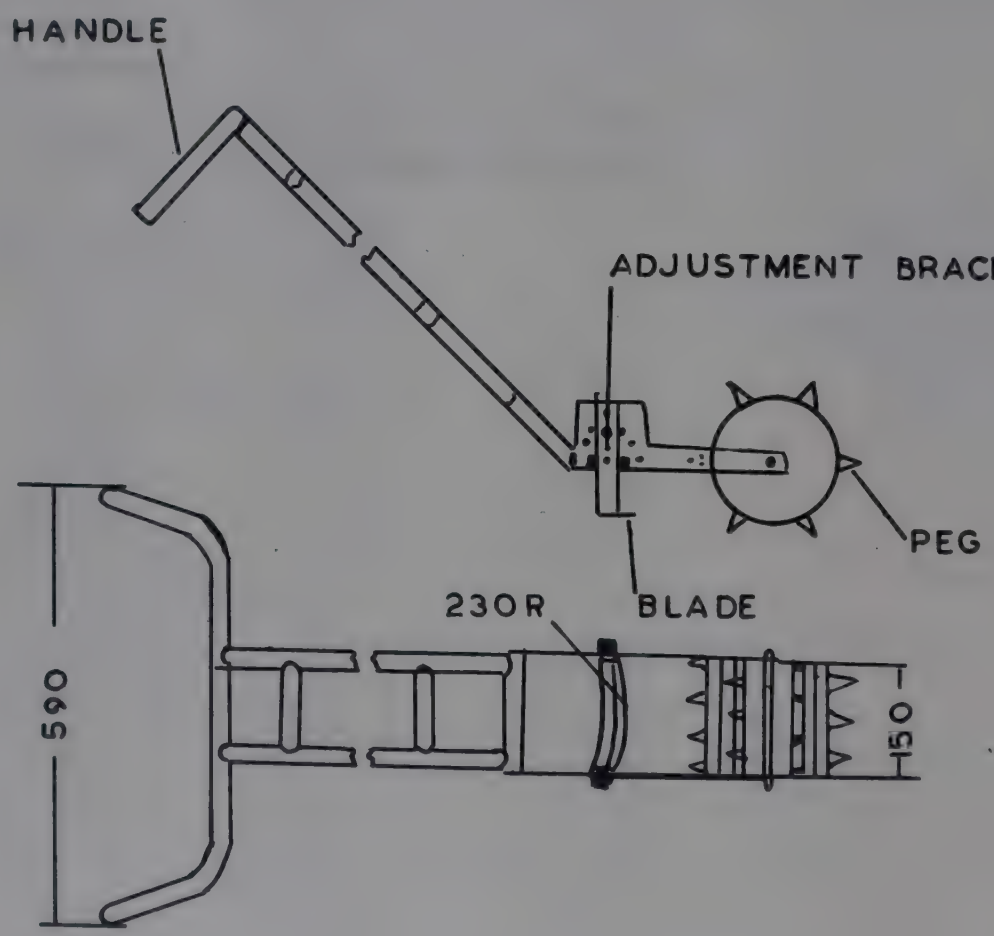
CONSTRUCTION : The bag is held open by a wire, inserted into the rim. The wire can be bent to suit the individual's hand and give the fingers maximum freedom of movement. At the side of the bag there are three holes — two small holes for either the thumb or little finger and a large central hole for the first three fingers of the hand.

WORKING : This handy device comprises a bag or chute, attached to the hand which enables the fruit to be picked into it (see figure 1). It is a non-stop continuous operation. It has the advantage of the opening of the bag being right under the fruit, while it is picked, so that it slides straight into it. For best results, both hands should pick into one bag (see Figure 2). The bag can increase the picking speed by 25 - 30%. It is an excellent device for horticultural purposes.

COST : Rs 10/- to Rs 25/-

SOURCE : THE DIXIE BAG COMPANY LIMITED
10 ISLINGTON HIGH STREET
LONDON NI 8EQ
UNITED KINGDOM

DRYLAND WEEDER



ALL DIMENSIONS IN MM

TECHNOLOGY NO. 65

DRYLAND WEEDER

DESCRIPTION : This star-type Dryland Weeder is designed for weeding row crops and serves as an excellent device for sandy and loamy soils.

CONSTRUCTION : Dryland weeder is 1648 mm long, 590 mm broad with a height of 1048 mm. It consists of three star-type wheels with the uniform diameter of 155 mm. The total weight of this device is 9 kgs.

WORKING : One woman can easily operate this weeder without any problem. When the weeder is pushed forward, the star-type wheels rotate briskly through the loamy soil and the curved blade cuts the roots of weeds. The output of this agricultural equipment is around 0.025 hectares per hour, with a working width of 150 mm.

COST : Rs. 100/- (approx.)

SOURCE : PROTOTYPE MANUFACTURING WORKSHOP
COLLEGE OF AGRICULTURAL ENGINEERING
TAMIL NADU AGRICULTURAL UNIVERSITY
COIMBATORE - 641 003
TAMIL NADU

MULTIPURPOSE WEEDER

TECHNOLOGY NO. 66

MULTIPURPOSE WEEDER

DESCRIPTION : Multipurpose weeder is an appropriate tool for agricultural purposes, especially for rural women of the hilly terrain. This device is a combination of the hoe and bush cutting tool.

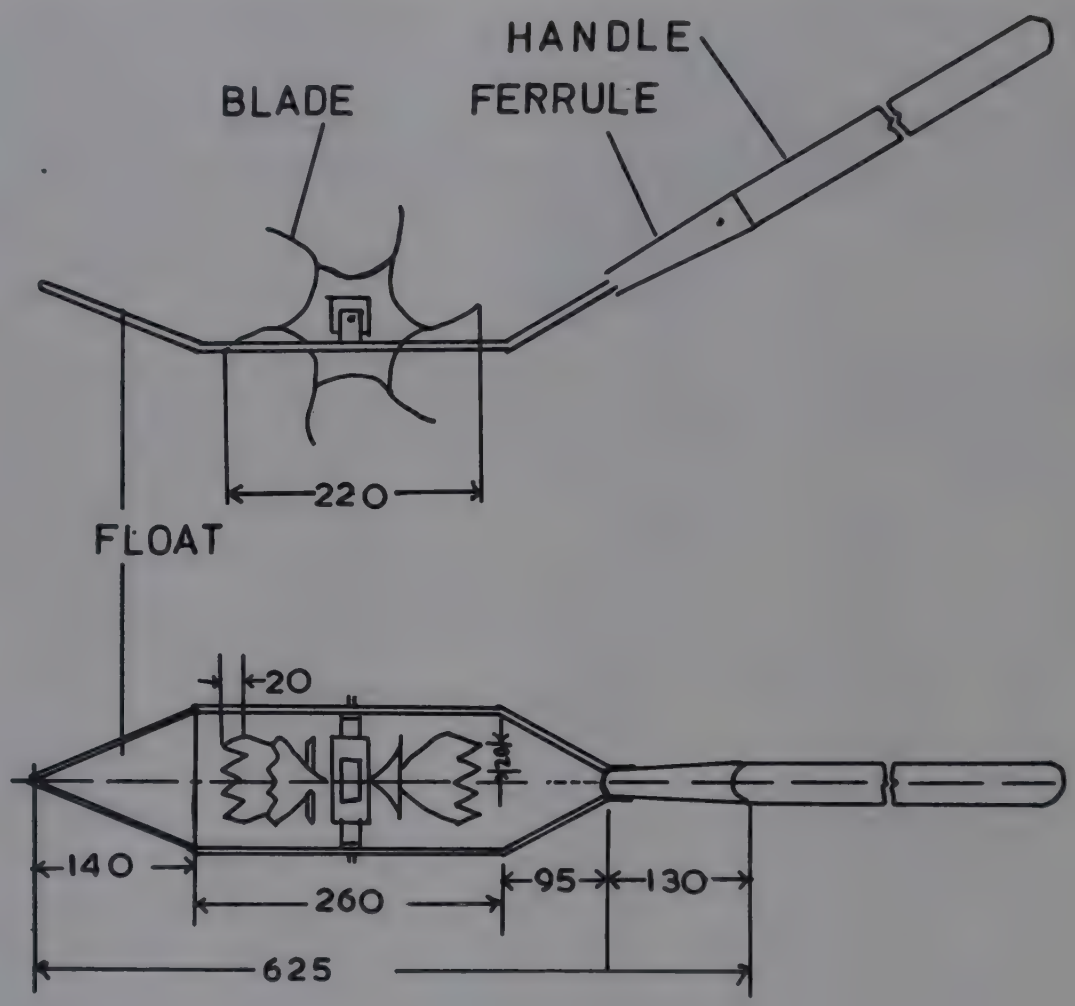
CONSTRUCTION : The multipurpose weeder is 22 cm long and 10 cm broad. The cutting edge has a length of 10 cm, whereas the wooden handle is 48 cm long.

WORKING : This weeder's cutting edge is used for cutting small bushes and the curved portion can be utilized in inter-culture operations. Multipurpose weeder is superior to the traditional hand-hoe as it reduces the drudgery by 25 to 30% on terraced or sloping land cultivation. Rural women are bound to find this technology very appropriate since it is quite simple and hence, easily adaptable.

COST : Rs.20/-

SOURCE : ICAR
RESEARCH COMPLEX
NORTH-EASTERN HILLS REGION
SHILLONG - 793 003
MEGHALAYA

ROTARY PADDY WEEDER



All dimensions in mm.

TECHNOLOGY NO. 67

ROTARY PADDY WEEDER

DESCRIPTION : This manual paddy weeder is used in uprooting low-intensity weeds.

CONSTRUCTION : The Rotary Paddy Weeder can be fabricated using local skills and locally available material.

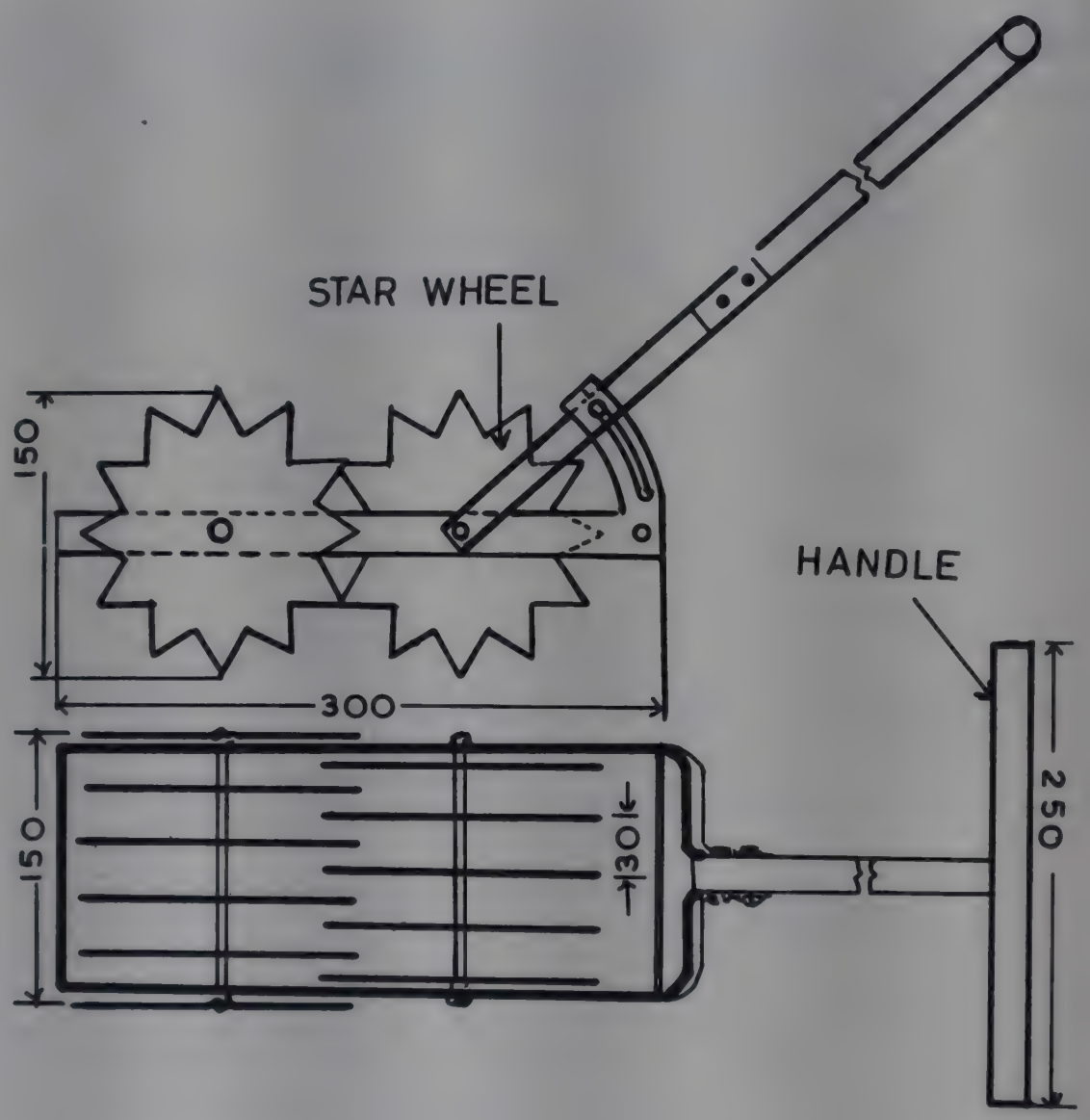
The weeder has a 120 cm long wooden handle to which is attached a weeding roll with a six-toothed blade.

WORKING : A single person can easily operate the Rotary weeder. It has the field capacity of weeding about 0.025 hectares per hour. This device is quite popular with the rural women of Madhya Pradesh.

COST : Rs.30/-

SOURCE : M.P. STATE DEPARTMENT OF
AGRICULTURE
PUTLIGARH
BHOPAL - 462 001
MADHYA PRADESH

STAR WEEDER



All dimensions in mm.

TECHNOLOGY NO. 68

STAR WEEDER

DESCRIPTION : The Star Weeder is an ideal agricultural equipment for dryland weeding as well as cutting weeds in fields.

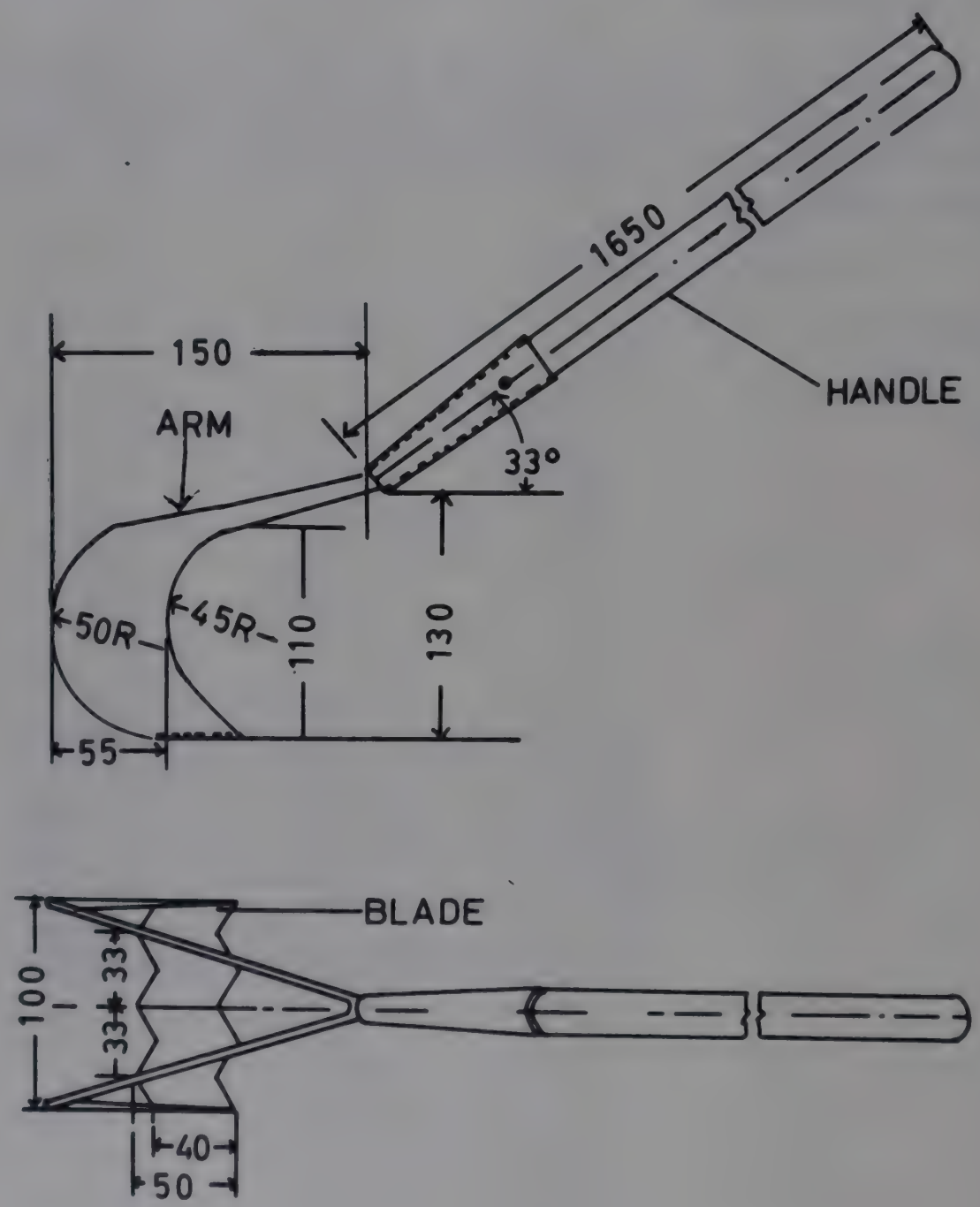
CONSTRUCTION : This manually operated device comprises of two gangs of star-shaped discs, mounted on a frame. It has a total length of 1400 mm, breadth of 25 mm and a height of 850 mm. The weight of Star Weeder is 2.5 kgs.

WORKING : The star discs of the front and rear gangs are staggered so as to effectively cover the working width. While operating in forward and backward motion, the teeth of the discs cut the weeds in the field. This implement has a field capacity of 0.025 hectares per hour. It is very simple to operate and is popular all over Orissa.

COST : Rs. 25/- for Mild Steel construction

SOURCE : M/S IMPLEMENT FACTORY,
SATYA NAGAR,
BHUBANESWAR - 751 007
ORISSA

DRAW WEEDER



All dimensions in mm

TECHNOLOGY NO. 69

DRAW WEEDER

DESCRIPTION : The Draw Weeder is suitable for dryland weeding purposes and is utilized for weeding.

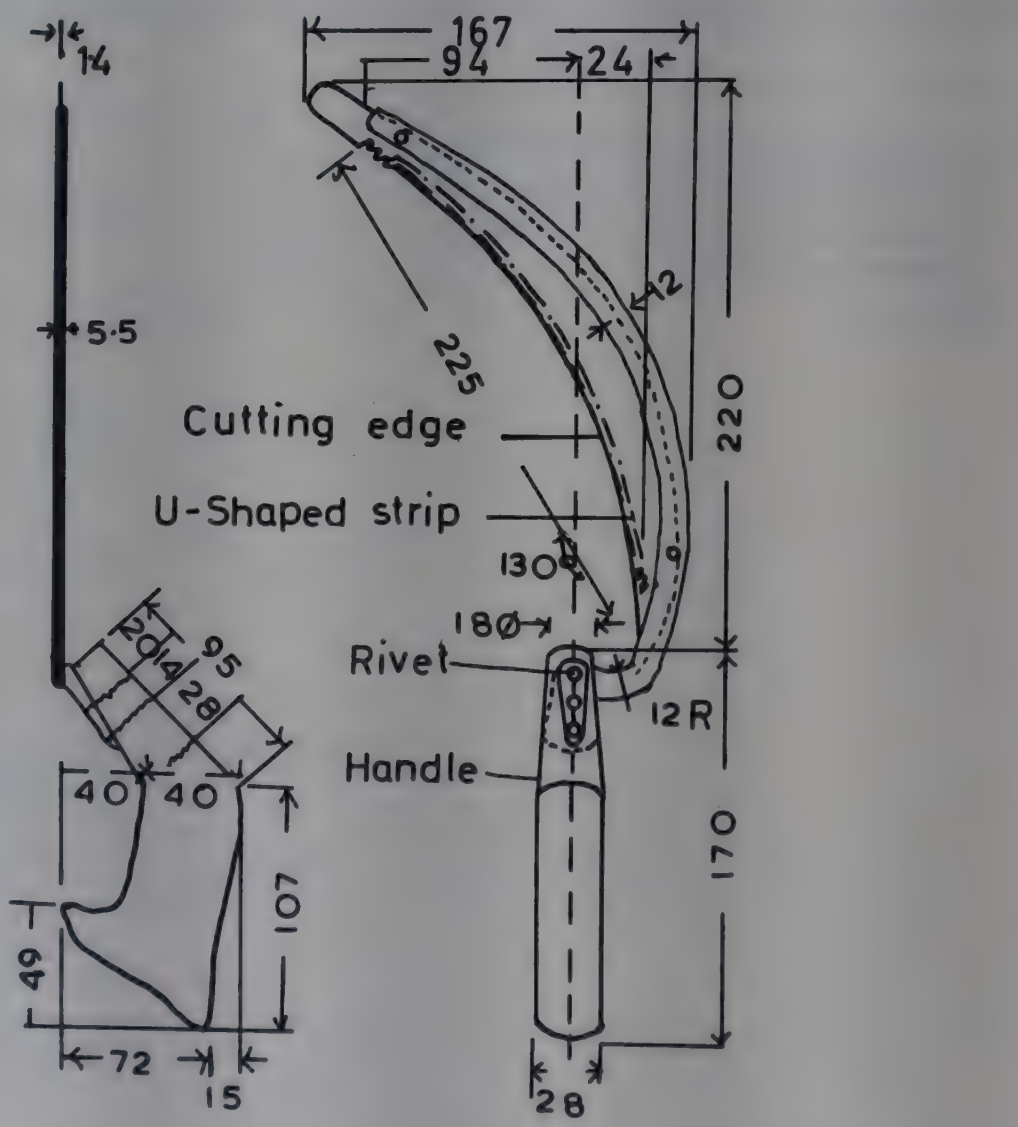
CONSTRUCTION : This manual agricultural equipment consists of a long handle with a toothed blade attached to it. This blade is supported by two arms, one on either end. The handle is made of wood whereas the blade is constructed with medium carbon steel. The material used in construction of the arms is mild steel sheet.

WORKING : This farm tool is a simple device. Utilizing the Draw Weeder is a single-man-operation. The toothed blade cuts the weeds while operating. The sharp points of the blade penetrate the soil thus facilitating weeding. The handle is at 35 degrees from the ground during the normal working position, thus resulting in reducing the drudgery of the rural women engaged in weeding operations.

COST : Rs. 20/- (approx.).

SOURCE : PROTOTYPE MANUFACTURING WORKSHOP
COLLEGE OF AGRICULTURAL ENGINEERING
TAMILNADU AGRICULTURAL UNIVERSITY
COIMBATORE - 641 003
TAMIL NADU

NAVEEN SICKLE



All dimensions in mm

TECHNOLOGY NO. 70

NAVEEN SICKLE

DESCRIPTION : The Naveen Sickle is an improved sickle which reduces the drudgery of rural women in harvesting wheat and rice crops.

CONSTRUCTION : This sickle has a wooden handle with a shape that provides a good grip and facilitates crop harvesting operations. The blade, made of carbon steel, is fixed to the handle through a 12 mm wide U-shaped strip and two rivets.

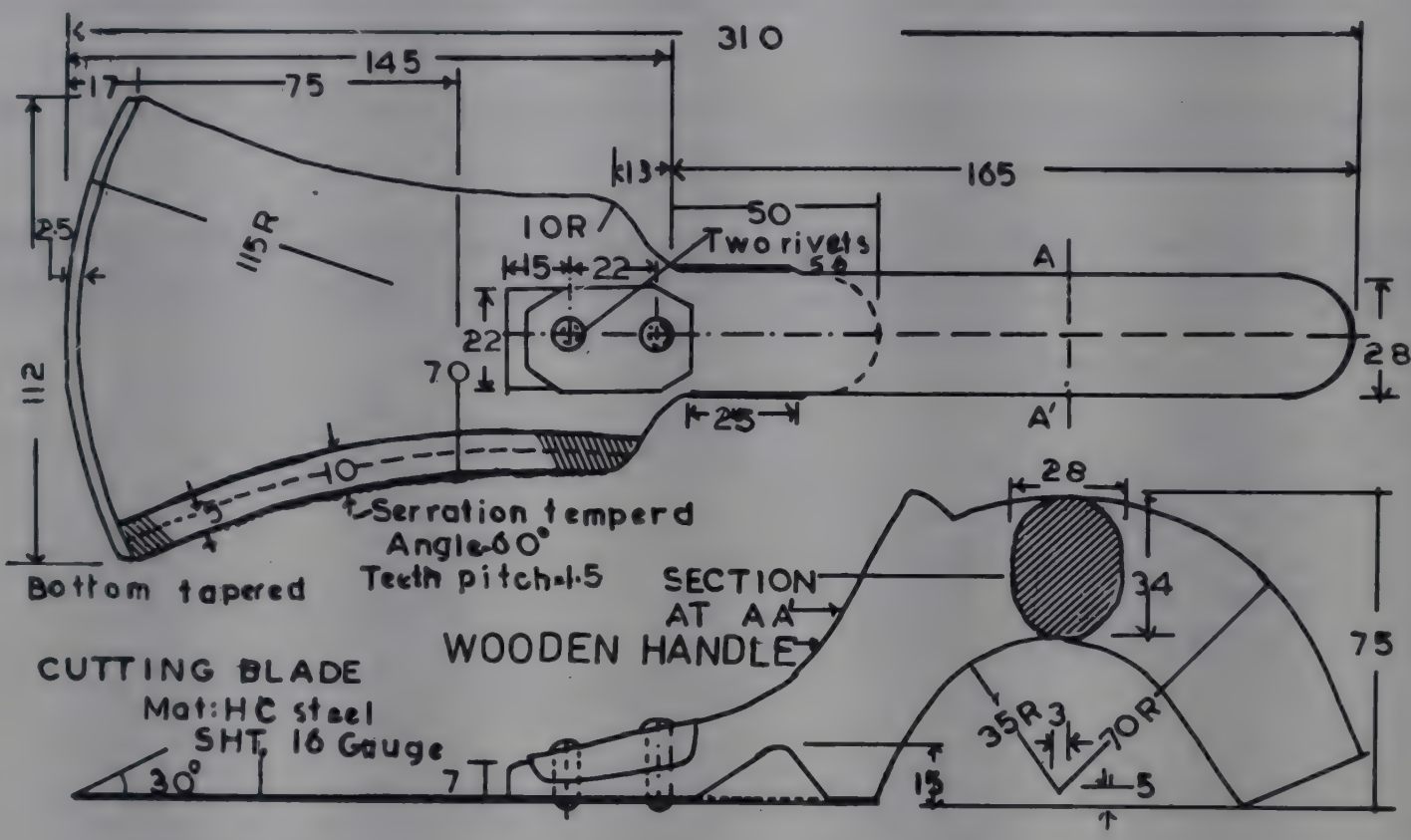
The cutting edge of the sickle is elliptical (with the eccentricity of the ellipse as 0.7), which makes it an effective agricultural tool.

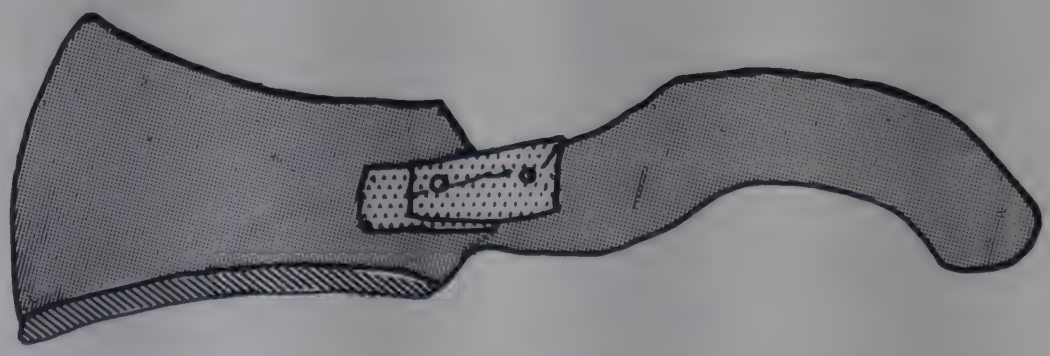
WORKING : The Naveen Sickle incorporates positive features of other improved sickles like the Punjab and Maharashtra agro-sickles. It has an actual field capacity of about 0.011 hectares per hour.

COST : Rs.15/- (approx.)

SOURCE : DIRECTOR
CENTRAL INSTITUTE OF
AGRICULTURAL ENGINEERING
NABI BAGH, BERASIA ROAD
BHOPAL - 462 018
MADHYA PRADESH

KHURPA CUM SICKLE





ALL DIMENSIONS IN MM

TECHNOLOGY NO. 71

KHURPA CUM SICKLE

DESCRIPTION : The Khurpa cum Sickle is a multipurpose hand tool which assists in weeding, hoeing, de-topping as well as cutting operations. This device could be easily manufactured by a village artisan. It is durable and also economical.

CONSTRUCTION : The blade of the tool, made of light carbon steel sheet of 1.6 mm thickness, has two working edges. The front edge is meant for weeding and hoeing while the inner edge is curved and serrated to cut like a sickle. The serrated edge has a curved length of 12 cms, which is about 60% of the curved length of a normal sickle. The handle is made of seasoned seesam wood and the total weight of this tool is 300 gms which is convenient for the smooth and continuous operation.

WORKING : Field testing of the device by IARI showed that the use of the khurpa-cum-sickle enhanced the field capacity by 7.3 % compared to a khurpa of the same size for weeding shallow or deep rooted weeds in a chilli field.

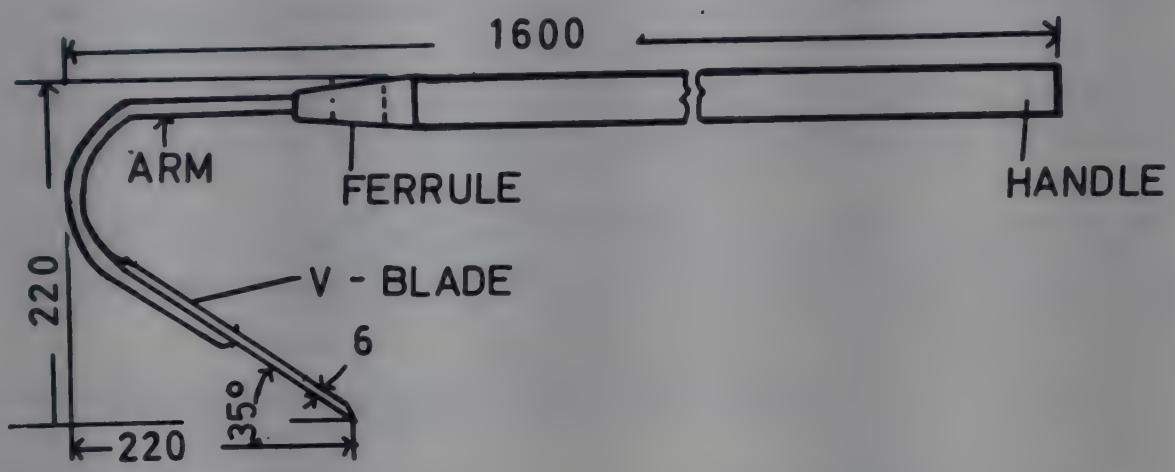
It showed an increase of 12.5% in the field capacity while it was field tested for detopping, weeding & hoeing in a coriander field.

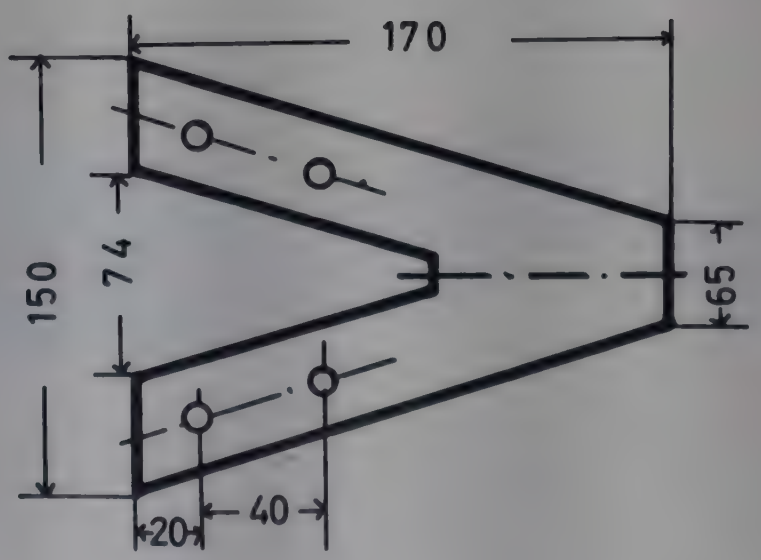
The tool was also tested for cutting Doab grams of an average length of 25 cms. It was found out than an average worker could cover an area of 0.016 hectares per day.

COST : Rs. 12/- (approx.)

SOURCE : THE HEAD
DIVISION OF AGRI. ENGINEERING
INDIAN AGRI. RESEARCH INSTITUTE
PUSA ROAD
NEW DELHI - 110 012

V-BLADE HAND HOE





V-BLADE
(DETAILS)

All dimensions in mm

TECHNOLOGY NO. 72

V-BLADE HAND HOE

DESCRIPTION : The V-Blade Hand Hoe is an appropriate tool for weeding out small weeds and is quite popular amongst rural women all across the sub-continent.

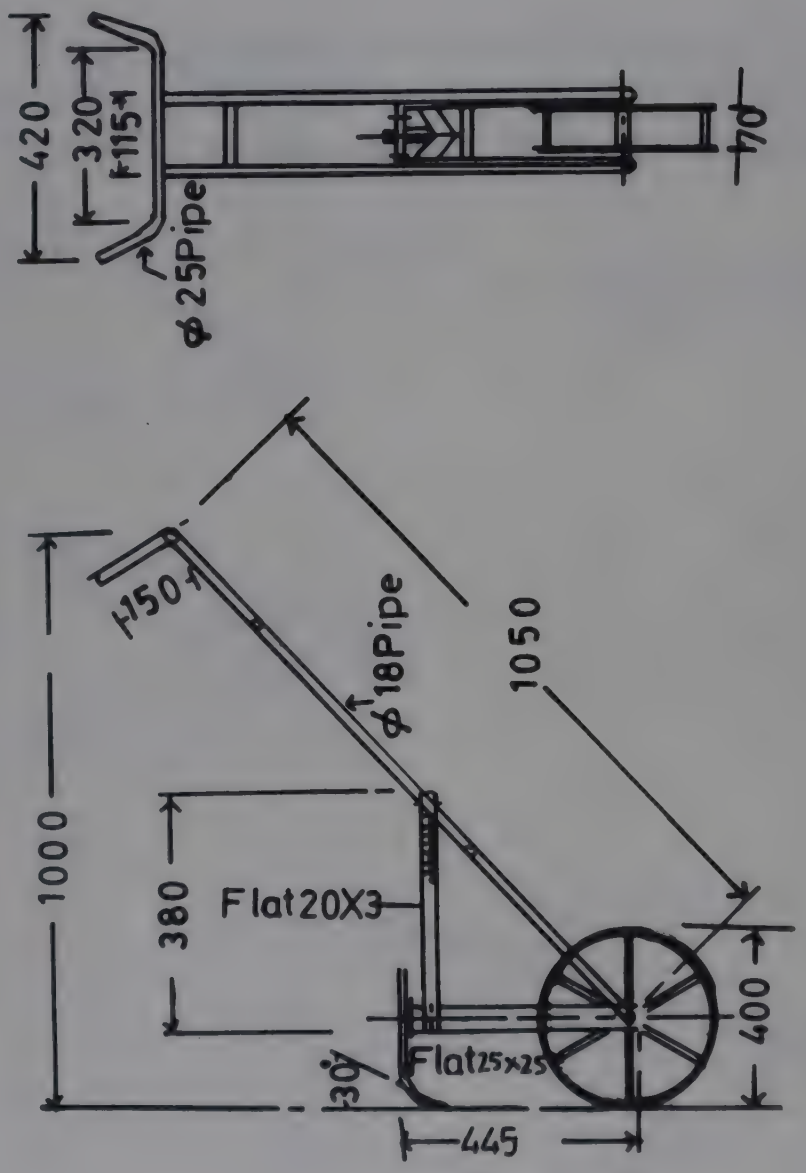
CONSTRUCTION : This agricultural equipment consists of a long mild-steel handle, joined to a curved arm by a ferrule and has a V-Blade, at the end of the arm, forming an angle of 35 degrees with the ground.

WORKING : The V-Blade hand hoe is operated manually by a single person. It is utilized in weeding row crops. At the first strike with the hoe, the V-shaped blade starts cutting a thin layer of soil and by repeating the strokes the earthing-up effect takes place, hence weeding the crops.

COST : Rs. 20/- (approx.)

SOURCE : COLLEGE OF AGRICULTURE ENGINEERING
TAMILNADU AGRICULTURAL UNIVERSITY
COIMBATORE - 641 003
TAMIL NADU

THE WHEEL HAND-HOE



All dimensions in mm.

TECHNOLOGY NO. 73

WHEEL HAND HOE

DESCRIPTION : This simple wheel hand hoe is an appropriate weeding tool for rural women as one woman can cover 0.36 hectares in a day with this inter-culture device. In other words, this agro-equipment is 4-5 times faster than the traditional khurpa and costs very little.

CONSTRUCTION : The new wheel hand hoe (see illustration) consists of a double ring wheel of 40 cm diameter made of 10 mm MS rod, with a bicycle wheel axle in the centre. It also has a mild steel handle, a tyne bracket and an adjustable tyne with a 13.5 cm wide shovel. Each wheel ring has six spokes of 6 mm rods pointed at the centre to a 25 mm ring. These wheel rings are then mounted on two sides of cycle axle and joined together by welding 6 mm rods between the corresponding spots at 25 mm from the wheel periphery.

The cycle axle, which helps in smooth movement of the weeder, is connected to the handle frame and the tyne bracket through slots provided in them. The handle frame and the tyne bracket are connected together with the help of a 20 mm wide M.S. flat having holes at different heights. These holes help adjust the height of the handle to suit the operator. The tyne is connected to the bracket at the desired height with the help of nuts and bolts.

WORKING : This 7 kg hand-hoe (see illustration) has a penetration angle of 30 degrees. In other words, it works the soil up to a depth of about 5 cms as compared to only 1 to 1.5 cm with the traditional khurpa. This device, utilized for weeding the wheat crop, is used in a walking position and not the strenuous sitting posture while working with a khurpa. Hence, it reduces the drudgery of the rural women in terms of the working posture as well.

The improved hoe could be easily operated in the rows without damaging any plant. This is because of the relative compactness and light-weight of the equipment.

COST : Rs 120/- to Rs. 150/- (approx.)

SOURCE : I.K. GARG,
RESEARCH ENGINEER
DEPTT. OF FARM POWER AND MACHINERY
PUNJAB AGRICULTURAL UNIVERSITY
LUDHIANA
PUNJAB

AGRICULTURAL IMPLEMENTS

FIG. A

FIG. B

TECHNOLOGY NO. 74

AGRICULTURAL HAND IMPLEMENTS

DESCRIPTION (A) : The Dao is the most common hand tool used in agriculture by rural women for clearing forest vegetation, erecting farm structures, cutting weeds and bushes, making wooden tools and storage structures, etc. (See the top illustrations).

CONSTRUCTION : It consists of a bamboo/wooden handle and a sharp, curved blade. The size and shape of the blades vary according to their usage and consequently, the weight varies from 10 gms to 700 gms.

COST : The cost of individual Daos varies from Rs. 5/- to Rs. 35/- (Different varieties of Daos used in North-Eastern hilly region are shown in the illustration).

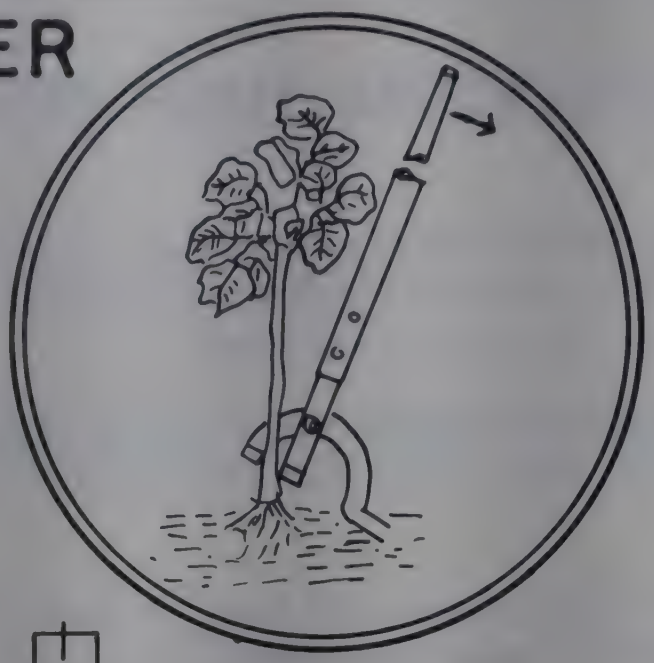
DESCRIPTION (B) : Small knives and sickles are the two main cereal harvesting tools used by rural women. Utilization of the knife is limited to crops grown in any system. (See the bottom illustrations).

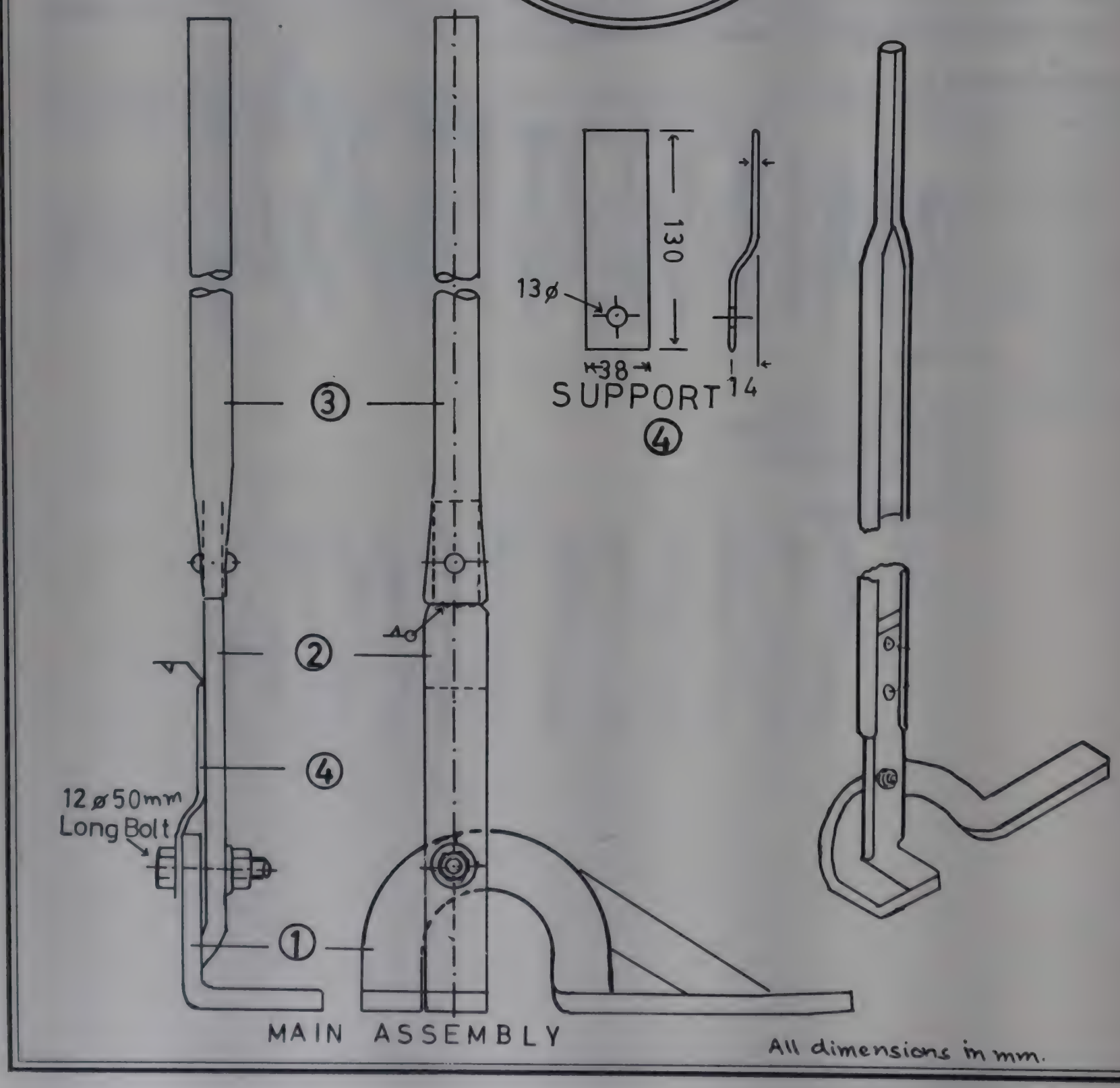
CONSTRUCTION : Kinves vary in shape and size from one state to another and from one tribe to the other and can be manufactured by local artisans using junk materials like iron strips and leaf springs. The cutting edge is either serrated or plain. Blades are short or long depending upon the field-conditions.

COST : Rs. 10/-

SOURCE : CENTRAL INSTITUTE OF
AGRICULTURAL ENGINEERING
NABI BAGH, BESARIA ROAD
BHOPAL - 462 018
MADHYA PRADESH

STALK PULLER





All dimensions in mm.

TECHNOLOGY NO. 75

STALK PULLER

DESCRIPTION : The Stalk Puller is an appropriate and simple agricultural equipment used to pull out plant-roots of sugarcane, cotton and pigeon pea.

CONSTRUCTION : This plant-stalk puller is a manually operated tool. It comprises of a one metre long mild-steel arm (37.5 x 12.5 m) and a semi-circular jaw, again of mild steel (37.5 x 12.5 m) with a total length of 47.5 cm.

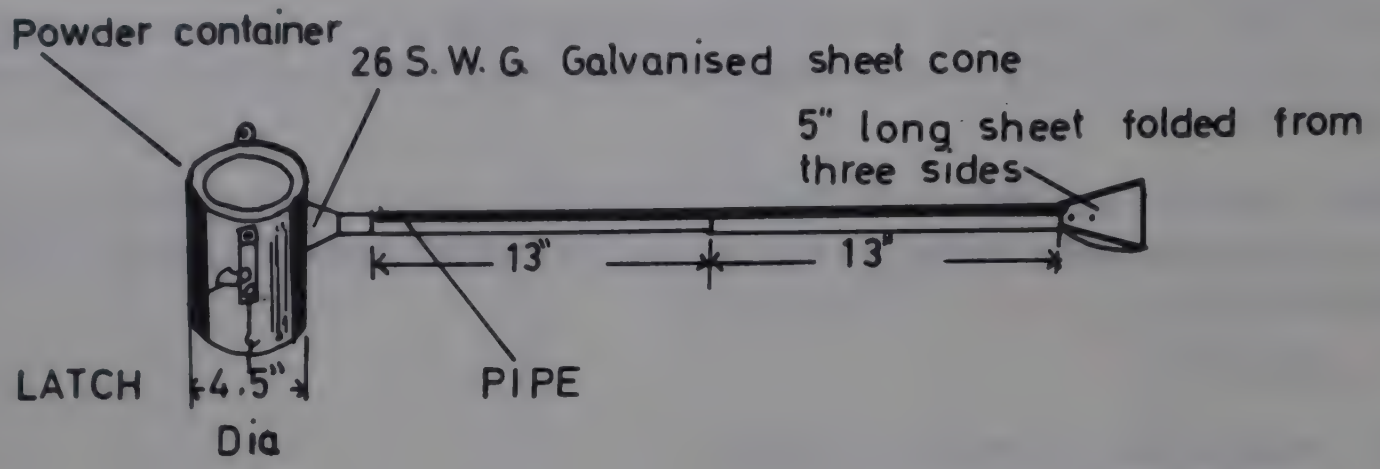
WORKING : In order to operate the Stalk Puller, the plant stem near the root is tightly held between the jaws and the arm is pulled towards the operator and the stalk get uprooted. Anybody can operate this agricultural device.

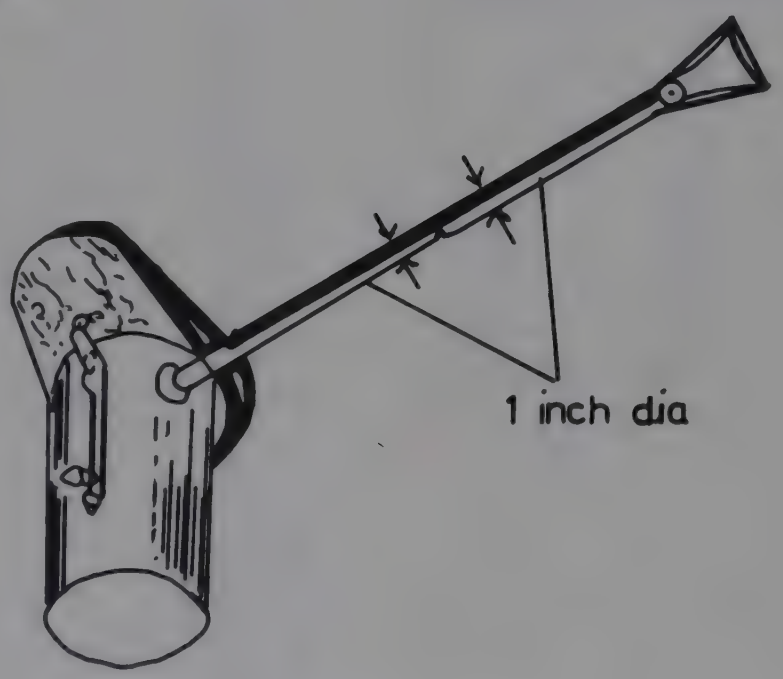
COST : Rs. 25/-

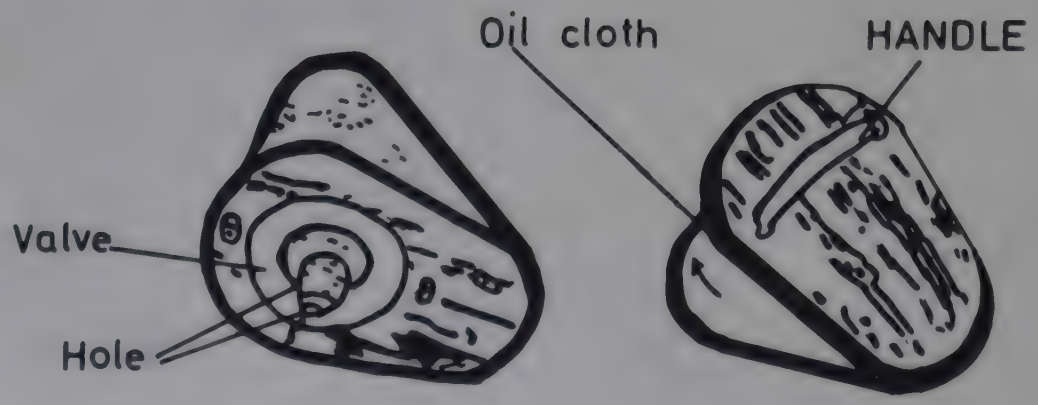
SOURCE : AGRICULTURAL TOOL RESEARCH CENTRE,
SURUCHI CAMPUS
BARDOLI 394 001
GUJARAT

WH 100
COMMUNITY HEALTH CELL
LIBRARY AND DOCUMENTATION UNIT
03765

WOODEN BELLOW DUSTER







TECHNOLOGY NO. 76

WOODEN BELLOWS DUSTER

DESCRIPTION : The Wooden Bellows Duster is an ideal equipment for spraying insecticides in little quantities in the fields. This economical duster is a handy device.

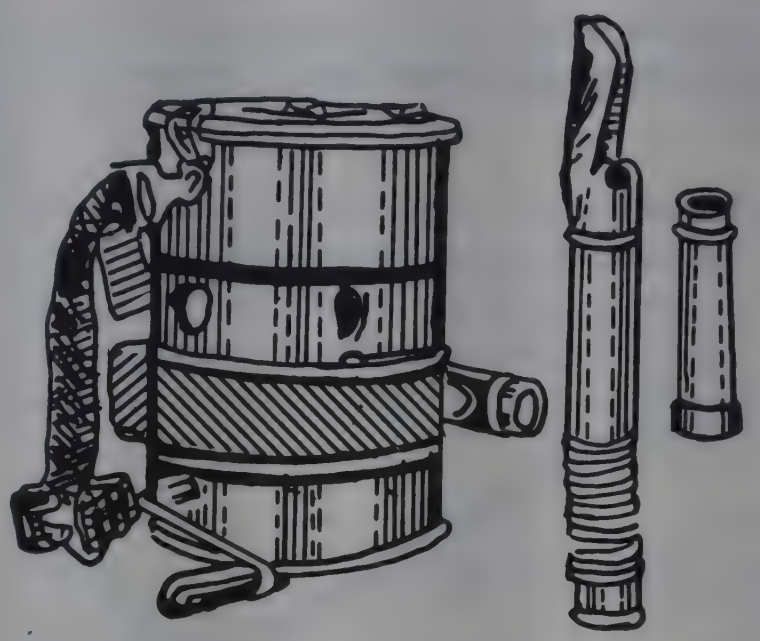
CONSTRUCTION : This wooden sprayer is operated manually and is quite a simple tool for dusting the crops. The duster comprises of a powder container with 11.25 cm diameter and a height of 15 cms. A galvanized sheet cone is fixed to his powder can, connecting a set of pipes with a total length of 32.5 cms and a uniform diameter of 2.5 cms. This spray pipe is attached to a 5 inch long sheet, folded from three sides, fixed on the nozzle of the sprayer. The wooden bellows is latched on to the top of the powder container.

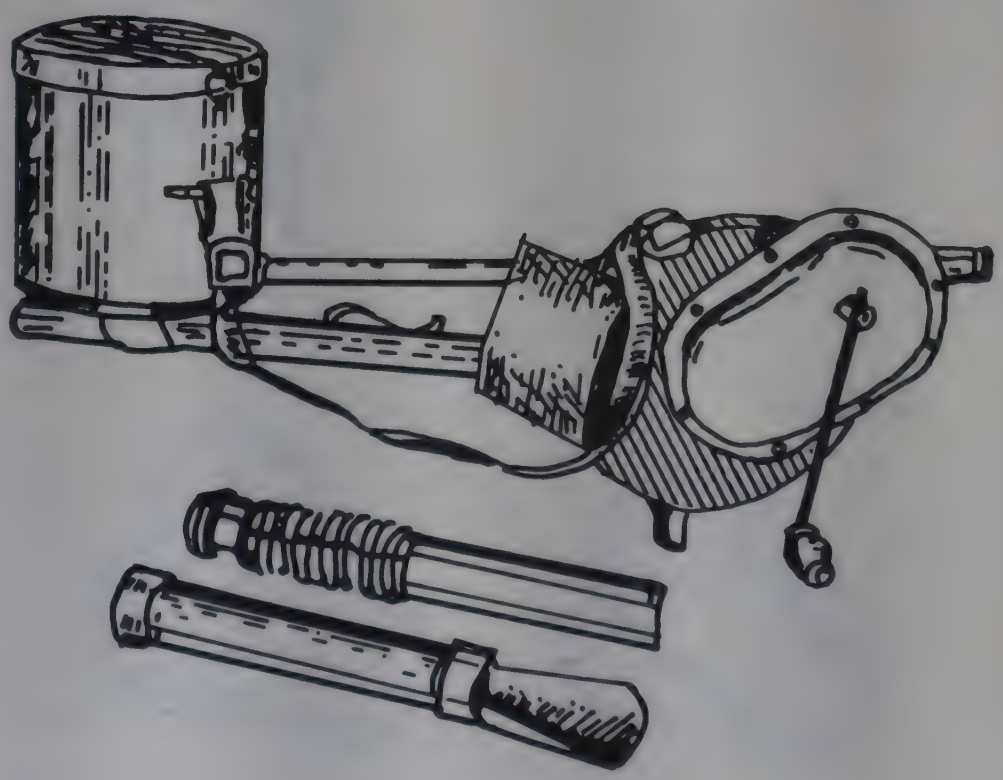
WORKING : The Wooden bellows duster is hung on the shoulder with the help of a strap. The bellows is worked with one hand and the spraying done with the other one. One should, however, take care that the device is completely air-tight, prior to the dusting operation. Another vital precaution is that the latch, connecting the bellows to the powder container, should be opened and the bellows disconnected before filling powder in the container. The Wooden Bellows duster acts on the one-way valve principle.

COST : Rs. 20/- (approx.)

SOURCE : AGRICULTURAL TOOL RESEARCH CENTRE
SURUCHI CAMPUS
BARDOLI - 394 601
GUJARAT

HAND ROTARY DUSTER





TECHNOLOGY NO. 77

HAND ROTARY DUSTER

DESCRIPTION : The Hand Rotary Duster is utilized for dusting field crops and vegetables with a pesticide in a powder form.

CONSTRUCTION : The duster has a small hopper and a fan which is cranked by hand through a gear arrangement. The hopper capacity is about 7000 c.c.

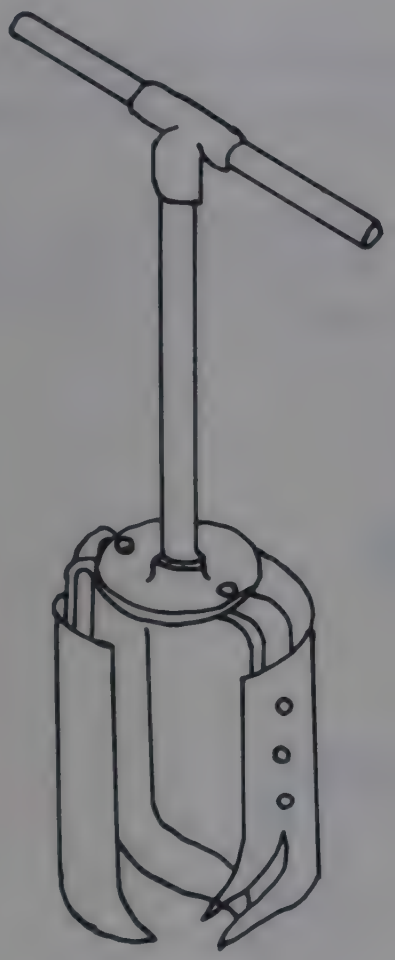
WORKING : When the crank-handle is rotated then it agitates the powder placed inside the hopper. The agitated powder lifts up and enters the connecting wind pipe and blows out of the delivery pipe to its destination.... crops in the field.

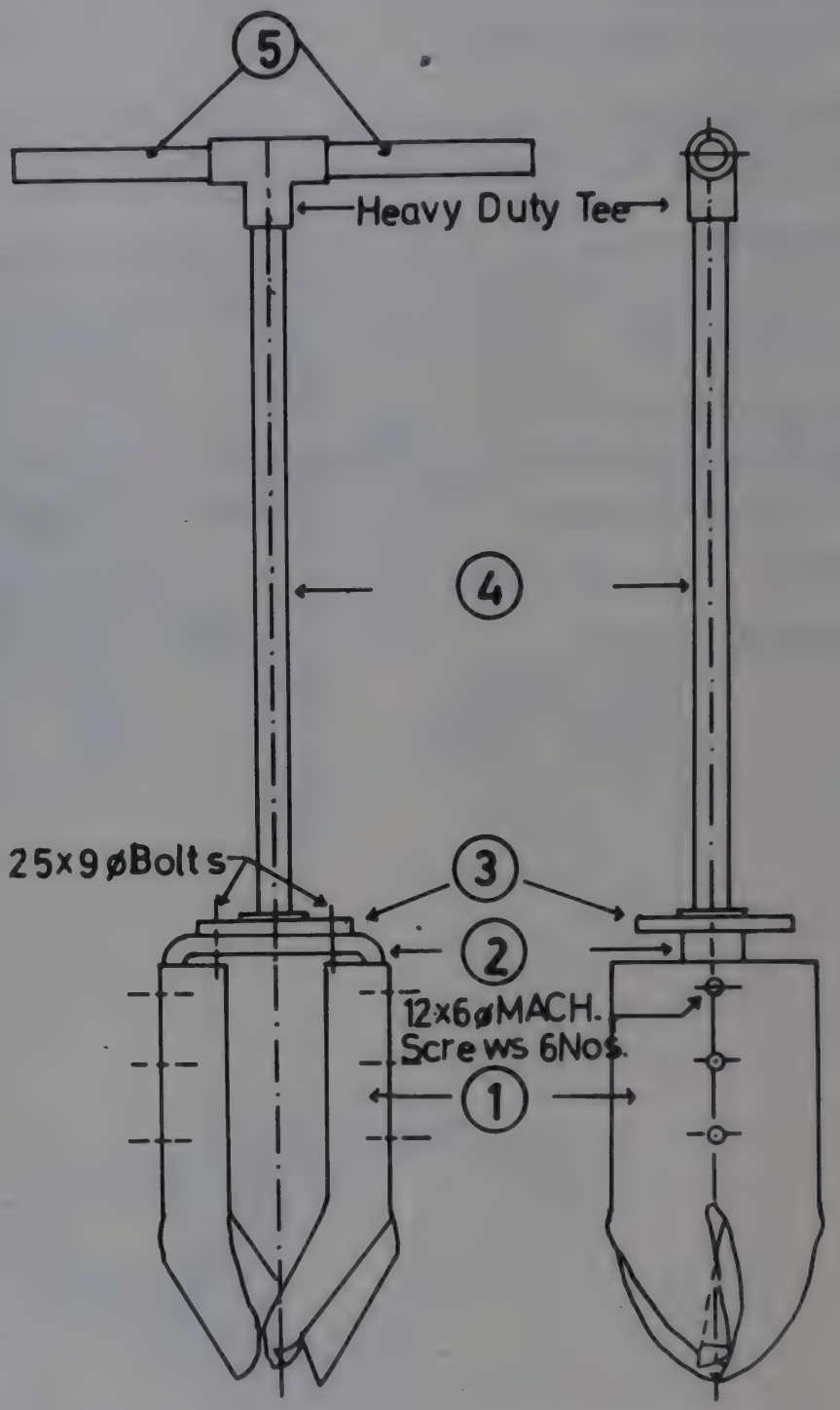
The air output of the fan is around 0.3 to 1.5 m^3 per minute when operated between 35 to 88 revolutions per minute of the crank handle. The weight of this duster is 7.5 Kgs ad it can dust 0.4 to 0.6 hectare of crops in a day. It is very simple to operate and a one-woman-job.

COST : Rs. 700/- (approx.)

SOURCE : NAFED
SAPNA BUILDING
59-EAST OF KAILASH
NEW DELHI - 110 065

HOLLOW EARTH AUGER





MAIN ASSEMBLY

All dimensions in mm.

TECHNOLOGY NO. 78

HOLLOW EARTH AUGER

DESCRIPTION : This handy implement is quite useful in digging shallow holes in fields either to fix poles for fencing or for localized cultivation purpose. It saves fertilizer as well as irrigation water. Hollow Earth Auger is also an appropriate agro-tool for planting saplings in barren land.

CONSTRUCTION : There are 5 major components of the Hollow Earth Auger (as illustrated in the diagram). They are as follows:

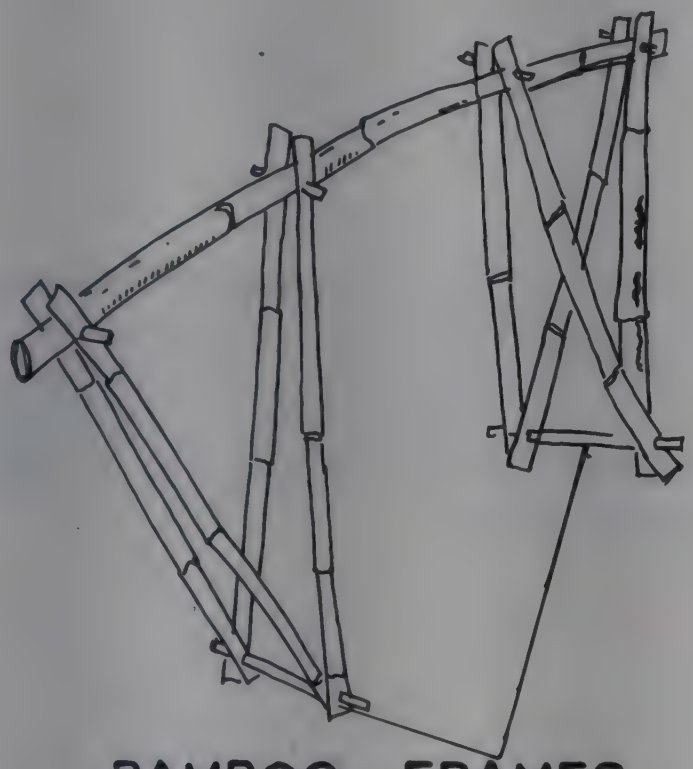
1. Blades — 2 pieces
2. Clamp
3. Heavy Duty Flange
4. Connecting Pipe
5. Handle pipe with heavy duty Tee.

WORKING : Put the tool where hole is to be dug, turn the horizontal handle clock-wise, while pressing it into the ground. Two lower blades cut the soil. The loose soil is collected within the two halves. Two side cutters decide the diameter of the hole. Thus all the four cutters of the tool dig the hole. In case when the upper crust of the ground is too hard, it should be loosened with a digging hoe and then the Earth Auger may be operated. When the ground is dry and hard, the process of digging becomes much easier by pouring some water on that spot.

COST : Rs. 200/- (approx.)

SOURCE : DIRECTOR
AGRICULTURAL TOOLS RESEARCH CENTRE
P.O. BOX 4, BARDOLI - 394 601
GUJARAT.

BAMBOO SHOULDER POLE



BAMBOO FRAMES

STACKED
FIRE WOOD

TECHNOLOGY NO. 79

BAMBOO SHOULDER POLE

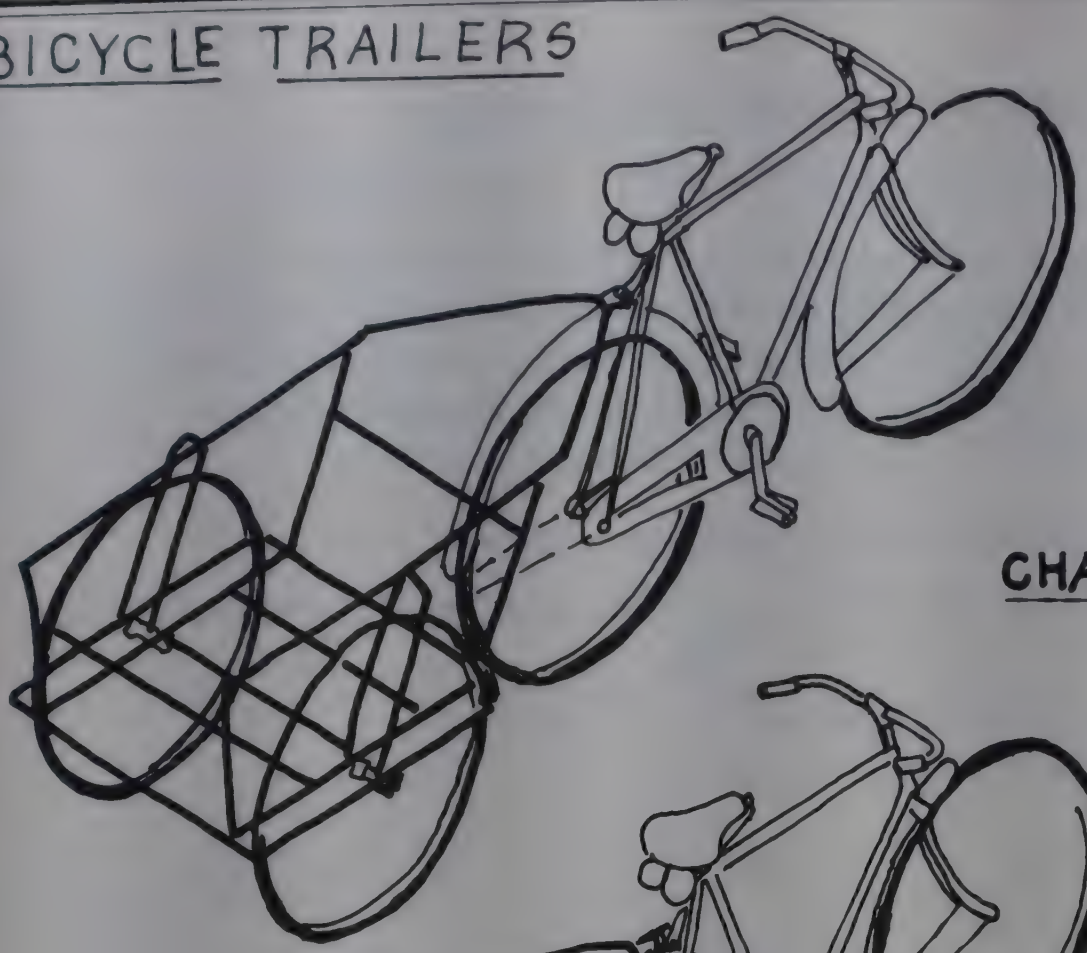
DESCRIPTION : This shoulder pole is made of bamboo. Two triangular bamboo frames at the ends of the pole would accommodate large amounts of stackable material like grass, cut-firewood and long leafy and root vegetables. This avoids the traditional practice of assembling, bundling and roping. One can shift the load from one shoulder to the other by turning the poles into position, bouncing the load upward and finally twisting his/her shoulders without losing stride.

ADVANTAGE : This device makes load-capacity less arduous and tiring.

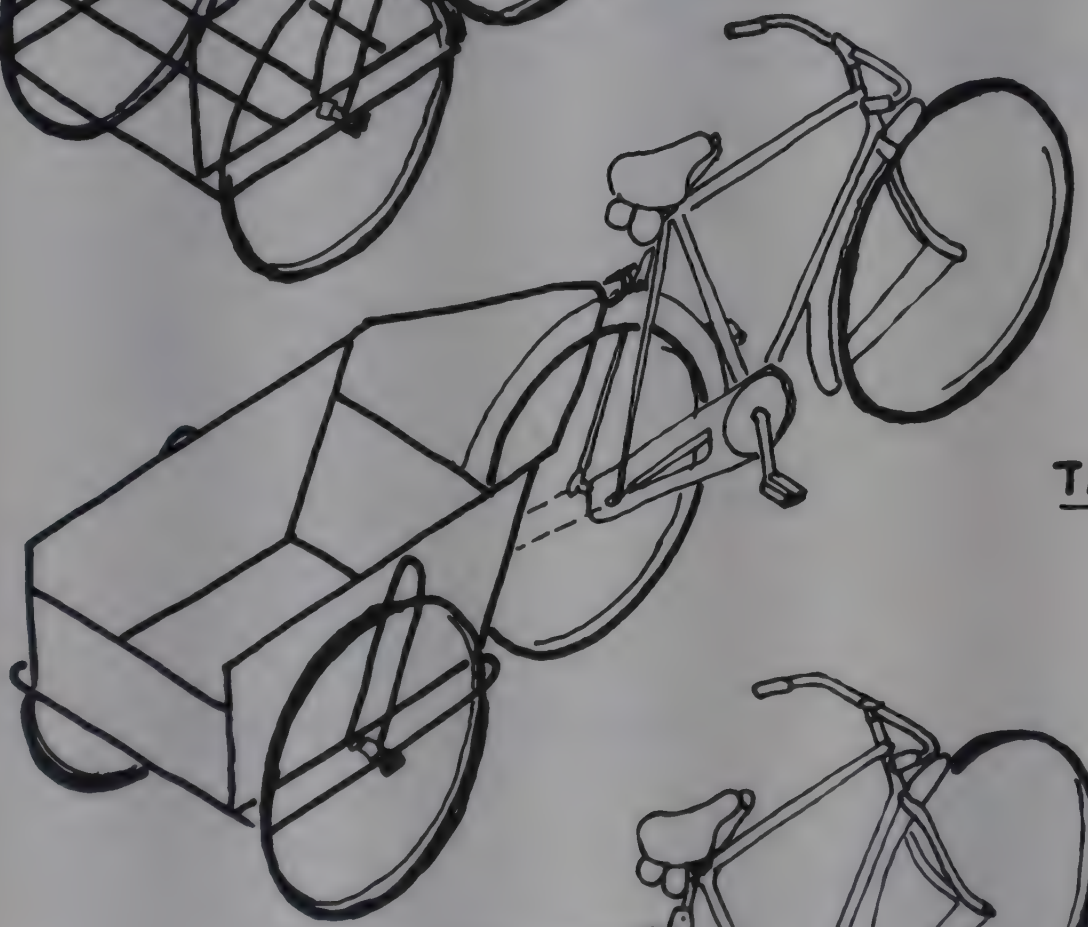
COST : The cost element is neglible. Materials and skills, to make the carrier are available easily in villages.

SOURCE : CONSORTIUM ON RURAL TECHNOLOGY (CORT)
D-320, LAXMI NAGAR
DELHI - 110 092.

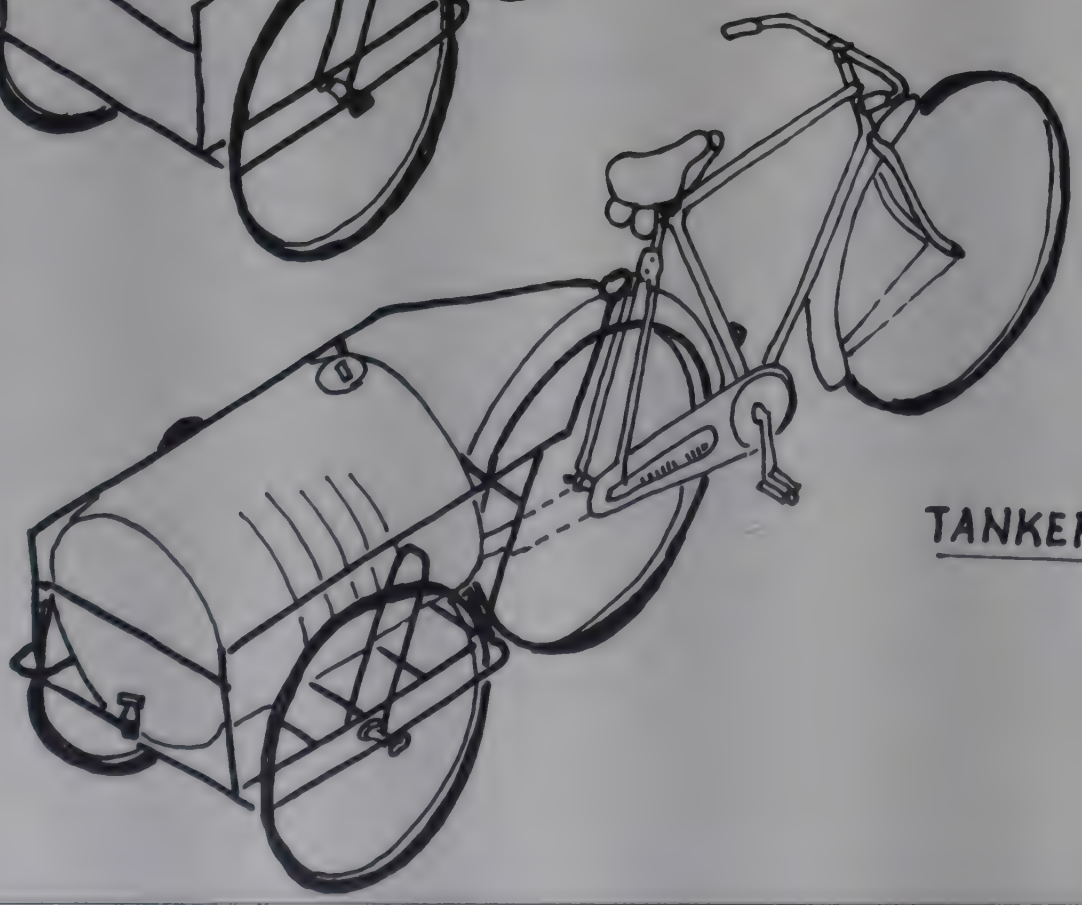
BICYCLE TRAILERS



CHASSIS TRAILER



TRAY TRAILER



TANKER TRAILER

TECHNOLOGY NO. 80

BICYCLE TRAILER

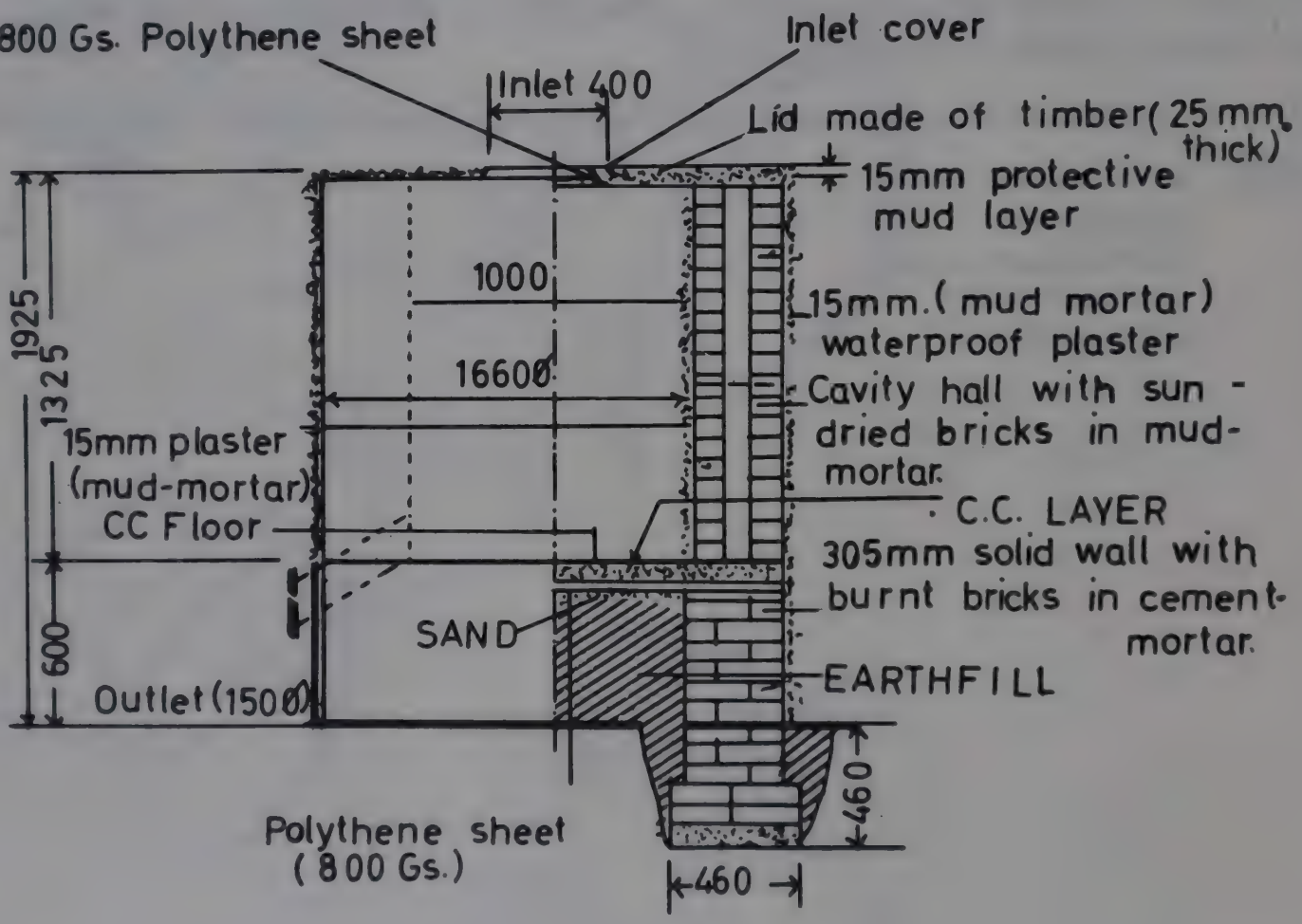
DESCRIPTION : It is a two-wheeler trailer which can be attached to a bicycle that is effective on paved or unpaved roads. The trailer consists of a strong light-weight tubular steel frame, heavy-duty cycle rickshaw wheels and a quick-release hitch mechanism. The trailer fits all makes of Indian bicycles. Being detachable, it does not affect the usefulness of the bicycle for personal transport and can also be used in fields or villages as a hand-cart.

ADVANTAGES : It can easily carry loads up to 150 Kgs, safely. It is well-balanced and easy to manouvre. It can be easily attached and detached from the bicycle and has a minimum maintenance. It also has a tanker-model which is meant to transport liquids or fluids. The bicycle-trailer has proved very useful in transporting various goods e.g., farm produce, domestic goods, agricultural goods and street vending (of vegetables, soft drinks etc.).

COST : The cost of a bicycle-trailer varies with the model from Rs. 980/- to Rs. 1380./-

SOURCE : NTTF TRAINING CENTRE
DAVA JIGUDEM
GANNNAVARAM - 521101
KRISHNA DISTRICT
ANDHRA PRADESH

CAVITY WALL BIN



All dimensions in m.m.

TECHNOLOGY NO. 81

CAVITY WALL BIN

DESCRIPTION : The Cavity Wall Bin is an economical, durable and useful grain-silo which is built with a thermal proofing technique.

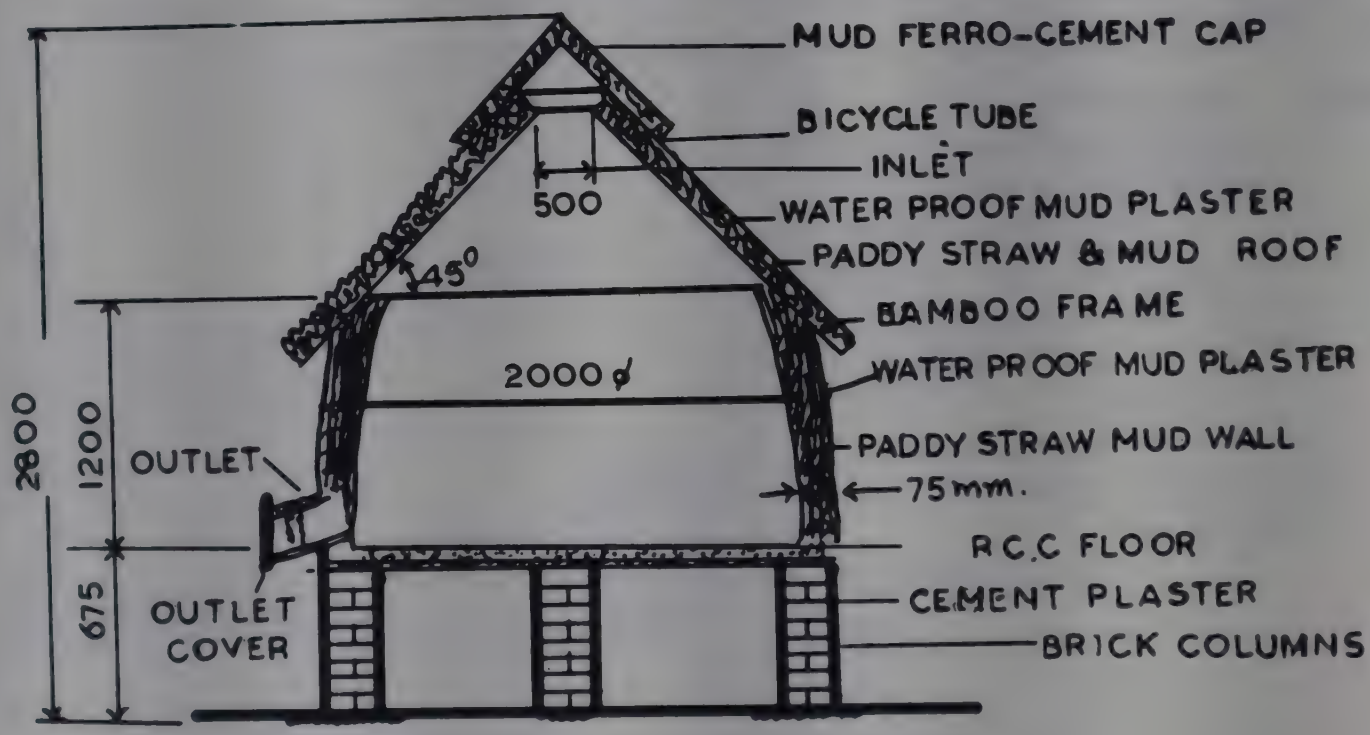
CONSTRUCTION : This improved silo comprises of a brick masonary base and a cavity wall made of unburnt bricks which are dried in the sun. It has a wooden roof with mud plastering. Two walls of 115 cm (in sun-dried bricks and mud-mortar) are constructed with a cavity or an air gap of 100 milli-metres. This entire structure is built on a brick masonary or cement-concrete base in order to check the intrusion of rats. Cow-dung is applied to fill up cracks on the outer wall of the bin. The cavity wall bin has a total capacity to house 0.7 metric tonnes of the grain.

PRECAUTIONS : The silo should be completely dry and absolutely clean before filling up the grain. It entails a regular maintenance for optimum storage.

COST : Rs. 500/- (approx.)

SOURCE : THE DIRECTOR
INDIAN GRAIN STORAGE INSTITUTE
HAPUR - 245 101 (U.P.).

PADDY STRAW MUD BIN



ALL DIMENSIONS IN MM

TECHNOLOGY NO. 82

PADDY STRAW MUD BIN

DESCRIPTION : The paddy-straw clay silo is a bin made of straw and clay for econommical and durable storage of the grain up to a total quantity of 3 tonnes.

CONSTRUCTION : This paddy straw mud bin is built upon an embankment, raised on brick columns (operated with cement), which is erected prior to the bin-construction. Upon a cement-concre floor, walls made of clay and paddy straw are raised and coated externally with a water-proof mud plaster.

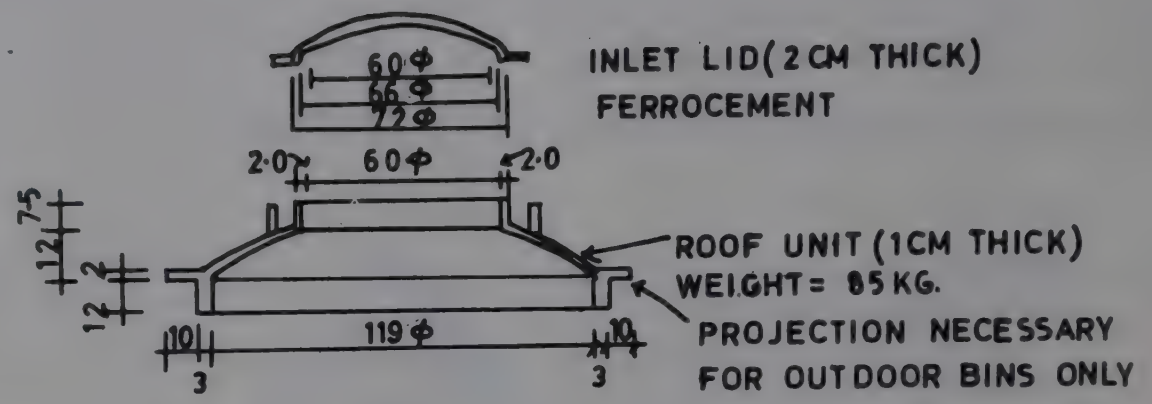
This water-proof plaster comprises of 2 kilograms of liquid bitumen and 0.25 kilograms of wax/apart from mud. The roof, which is also plastered the same way, is constructed with clay and straw over a frame of bamboo sticks. An inlet as well as an outlet, is provided for the grain.

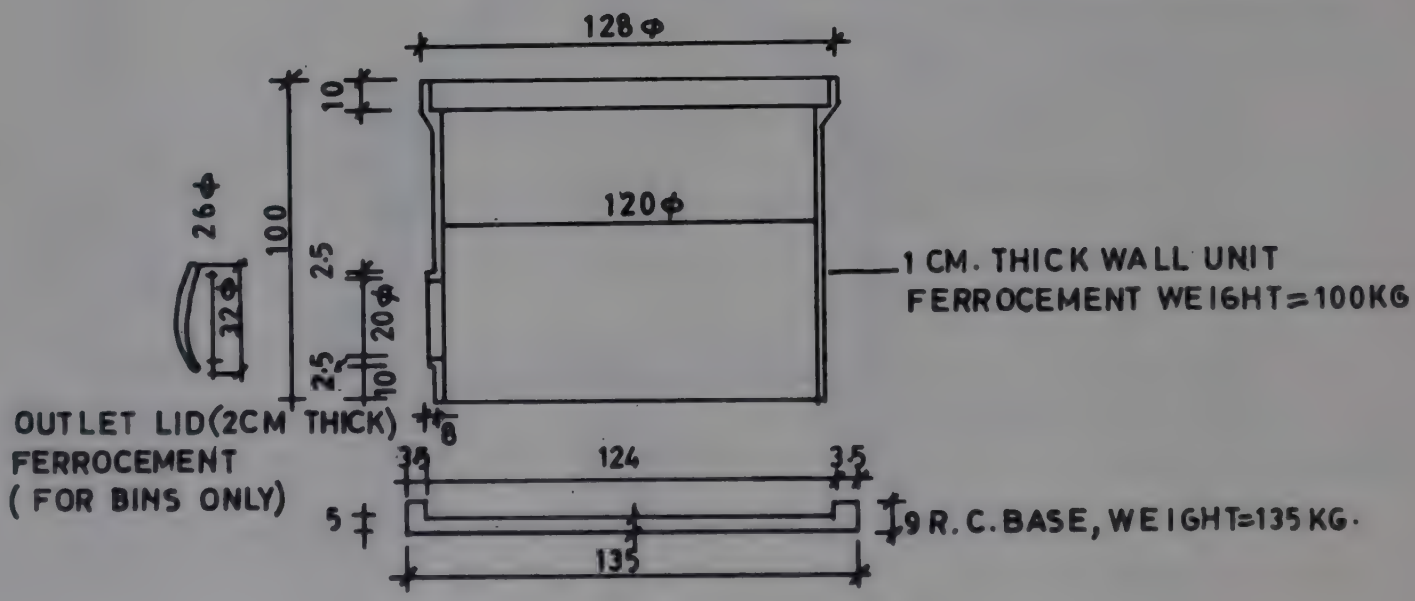
The grain should be throughly cleaned and dried prior to sotrage.

COST : Rs. 900/- (approx.)

SOURCE : DIRECTOR
INDIAN GRAIN STORAGE INSTITUTE
HAPUR - 245 101
UTTAR PRADESH

FERROCEMENT STORAGE BINS





SECTIONAL ELEVATION

ALL DIMENSIONS IN CM.
(NOT TO SCALE)

TECHNOLOGY NO. 83

FERROCEMENT STORAGE BINS

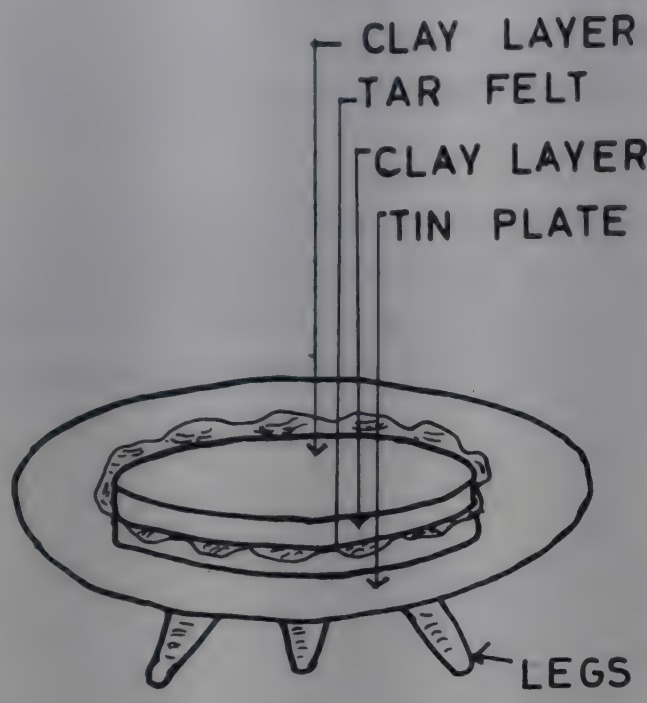
DESCRIPTION : Ferrocement storage bins or ferrocement watertanks are basically constructed with a versatile from of reinforced mortar comprising closely spaced layers of wire reinforcement, impregnated with a rich cement mortar. It is economical, rodent-proof, fire-proof and damp-proof. Most of all, it can be easily fabricated at the rural level.

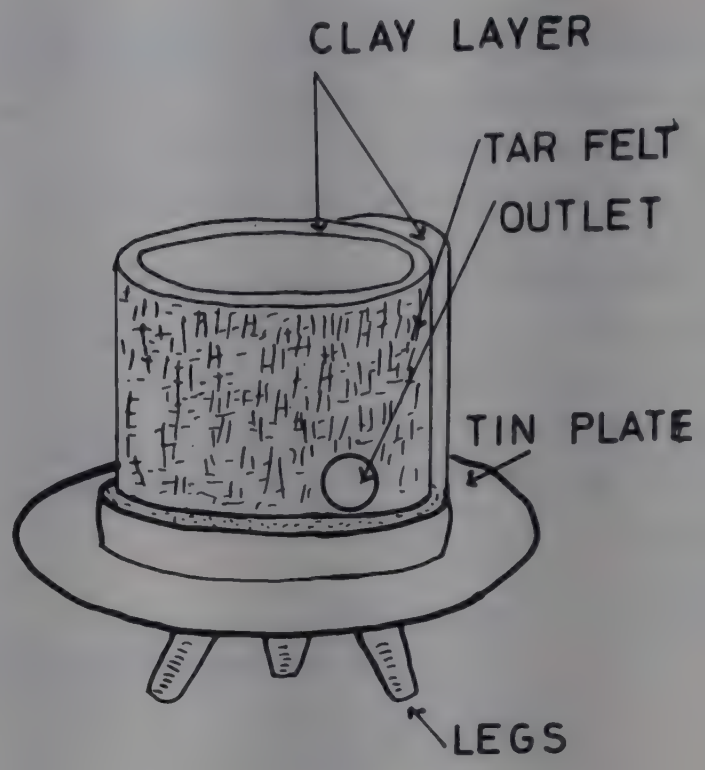
CONSTRUCTION : These storage bins are cylindrical in shape and are assembled from prefabricated components, viz., base slab, wool unit, and dome-shaped roof unit. A manhole is provided in the roof unit for loading and an outlet in the bottom wall unit for unloading the grain. Gaskets are provided to make the bins air-tight. The external surface of bins is painted with a bituminous aluminium paint. The entire unit can be constructed by 4 persons.

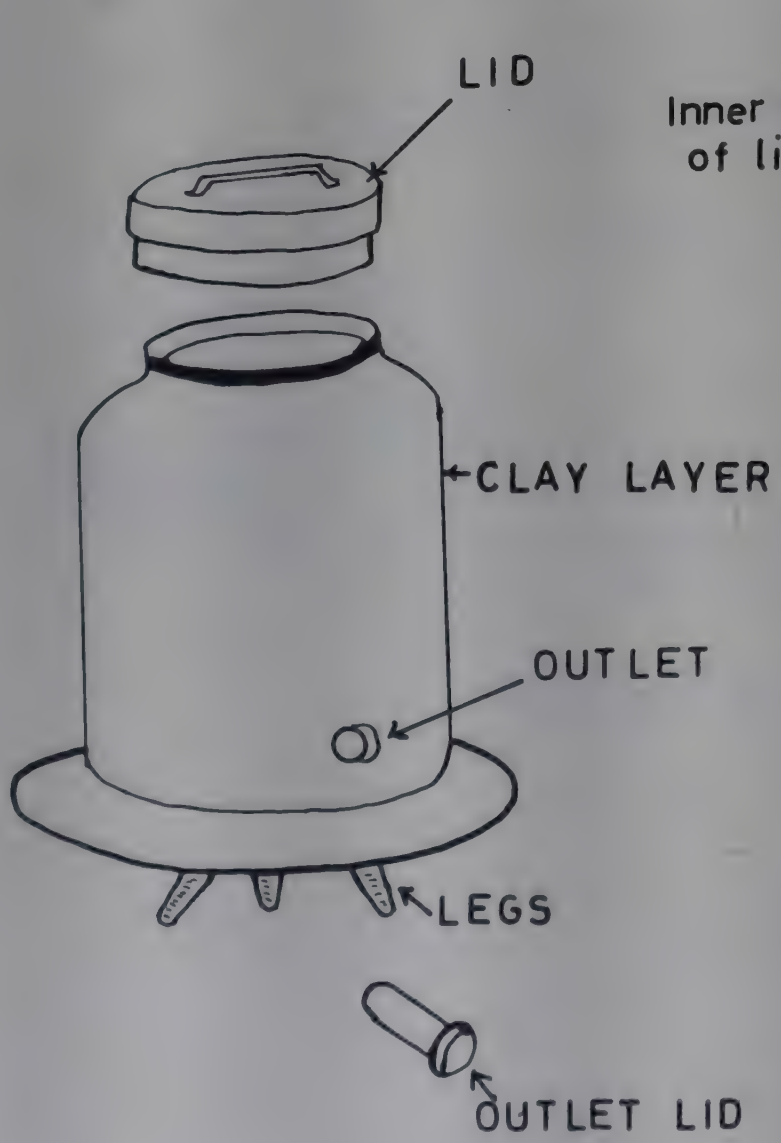
COST : Rs. 500/-

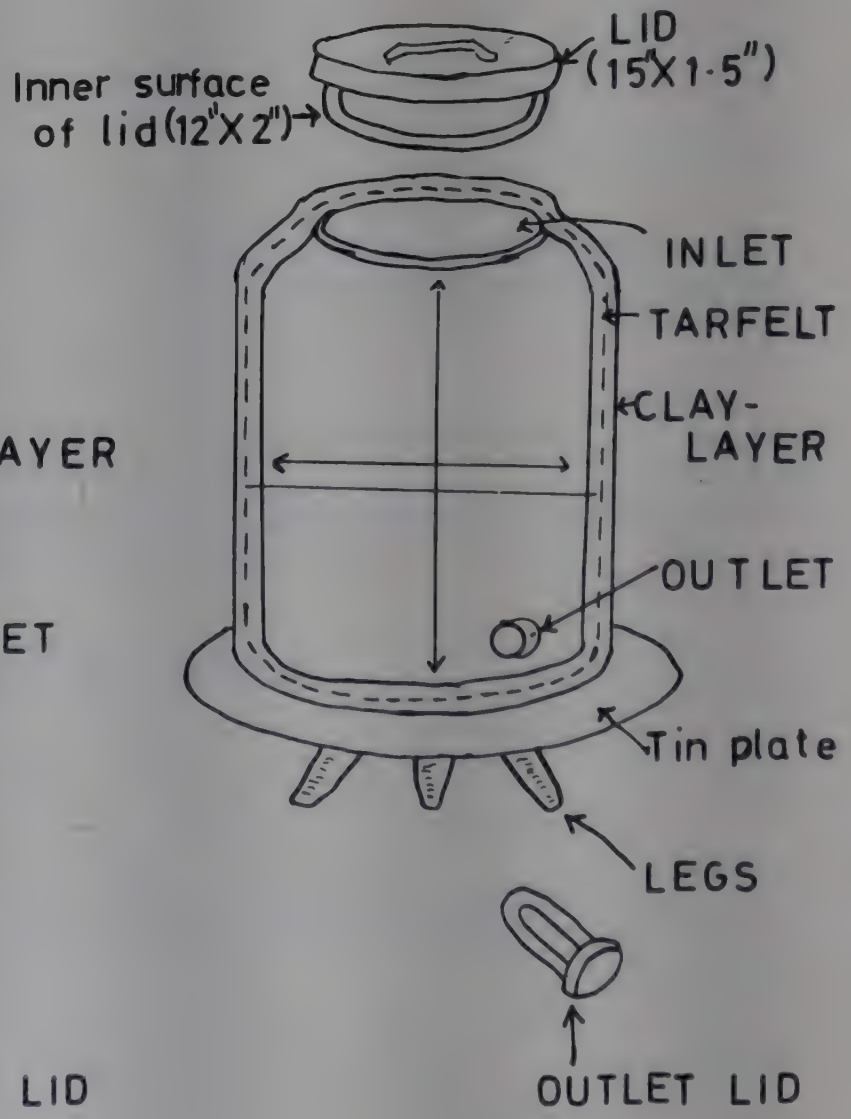
SOURCE : THE DIRECTOR
STRUCTURAL ENGINEERING RESEARCH CENTRE
ROORKEE
UTTAR PRADESH

PANTNAGAR KUTHLA









TECHNOLOGY NO. 84

PANTNAGAR KUTHLA

DESCRIPTION : The Pantnagar Kuthla is an efficient clay grain-silo. This storage tank protects the grain against moisture and crop-pests. This economical device is a boon for small and marginal farmers as they can utilize it for a full six-month tenure.

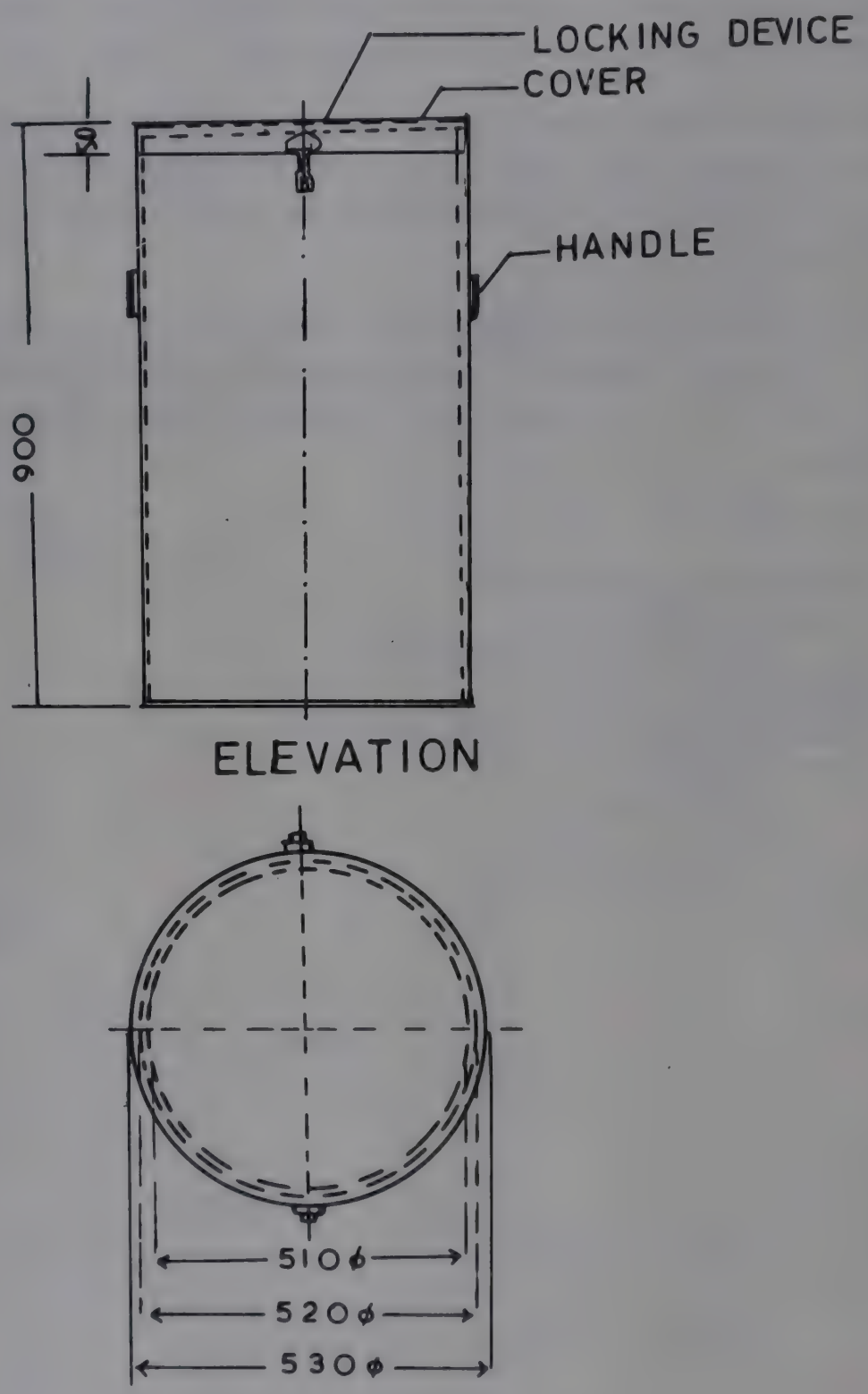
CONSTRUCTION : This silo is made of clay. A single layer of tarfelt is placed between two clay layers for protection purposes. The tarfelt layer prevents moisture from seeping into the walls and destroying the grain inside. A tin plate at the bottom of the Kuthla, supported with a stand checks further pest invasion.

WORKING : In order to obtain optimum results, dry the grain to such an extent that the moisture percentage is from 8 to 10 percent. This grain should be clean and free from insects. As a preventive measure use EDB for sure protection. Never open the Kuthla or silo during monsoons or high-humidity periods.

COST : Rs. 150/-

SOURCE : DEPARTMENT OF ENTOMOLOGY
COLLEGE OF AGRICULTURE
G.B. PANT UNIV. OF AGRI & TECHNOLOGY
PANTNAGAR,
NAINITAL - 263 145.
UTTAR PRADESH

COALTAR DRUM BIN



(Capacity 1.5 QTLS)

All dimensions in mm.

TECHNOLOGY NO. 85

COALTAR DRUM BIN

DESCRIPTION : The Coaltar Drum Bin is an effective grain silo for storing not-so-large quantities of seeds and foodgrains in a safe manner.

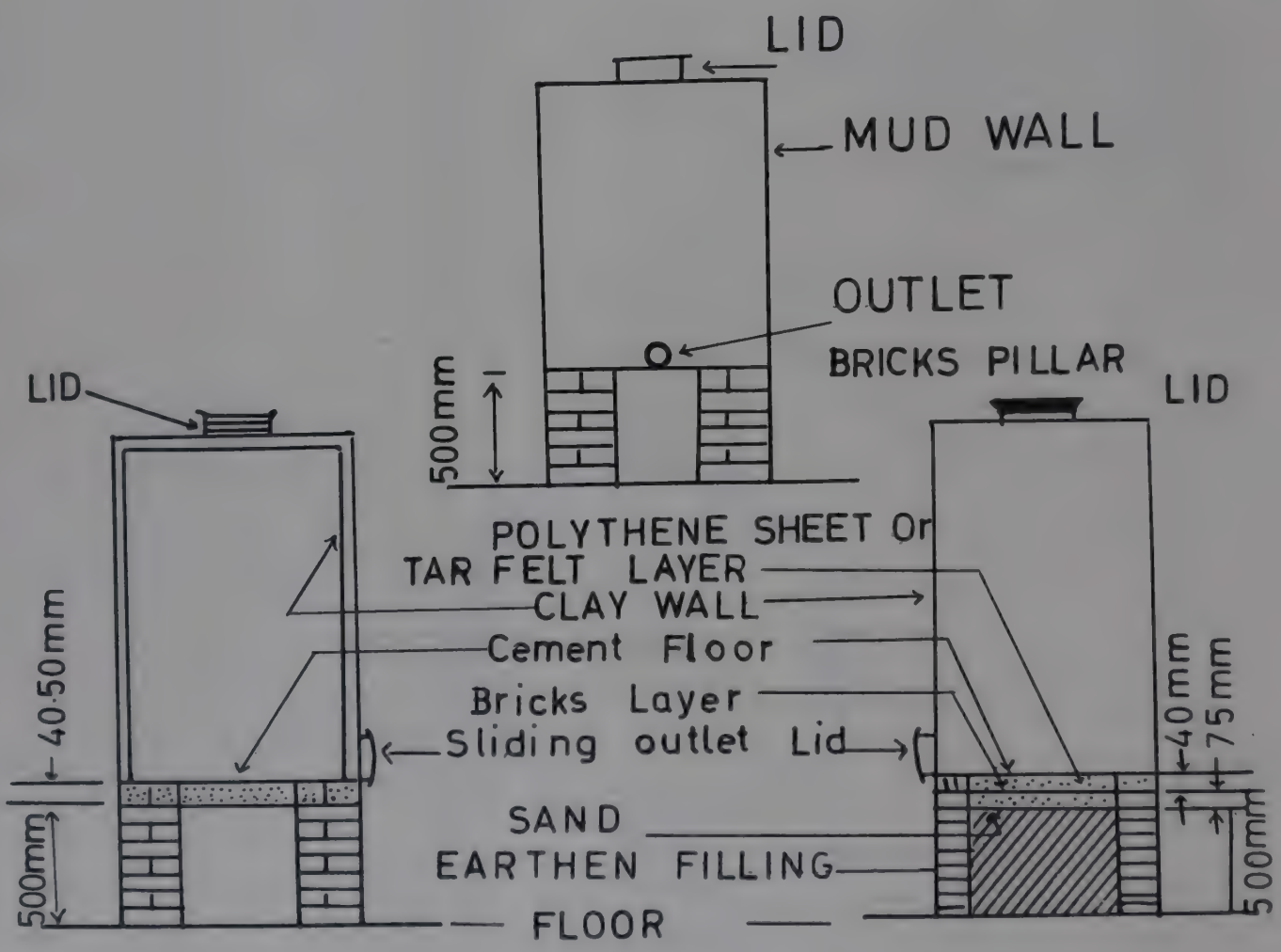
CONSTRUCTION : This low-cost silo is a metal bin constructed out of used coal-tar drums. The bin has a metallic cover with a locking arrangement.

WORKING : The Coaltar bin hardly requires any maintenance. Precautions must be taken to keep the lid tightly closed after filling the grains and not open it during monsoons or high-humidity periods. It has a storage capacity of 1.5 quintals of wheat and 1.25 quintals of gram.

COST : Rs. 100/-

SOURCE : DIRECTOR
CENTRAL INSTITUTE OF
AGRICULTURAL ENGINEERING
NABI BAGH, BERASIA ROAD
BHOPAL - 462 018
MADHYA PRADESH

IMPROVED GRAIN SILO



TECHNOLOGY NO. 86

IMPROVED GRAIN SILO

DESCRIPTION : The Improved Grain Silo is a modified traditional silo, which is fairly airtight and moisture-proof. It is also quite free from the harmful effects of temperature complications.

The Improved Silo is constructed over a 50 cm high embankment, supported by brick pillars. The silo is made of clay mixed with paaddy husk or wheat husk. It is constructed, layer by layer and left for drying. A hole is left at the top, which is covered with a lid. Another hole is left near the bottom, to facilitate the exit of the grain. The walls of the silo are plastered with a clay-cowdung slurry. A layer of polythene or tarfelt is sandwiched between the cemented flour of the silo and the brick masonary, over which the silo rests.

ADVANTAGE : The Improved Grain-Silo can retain post-harvest grain for a period of 6-10 months.

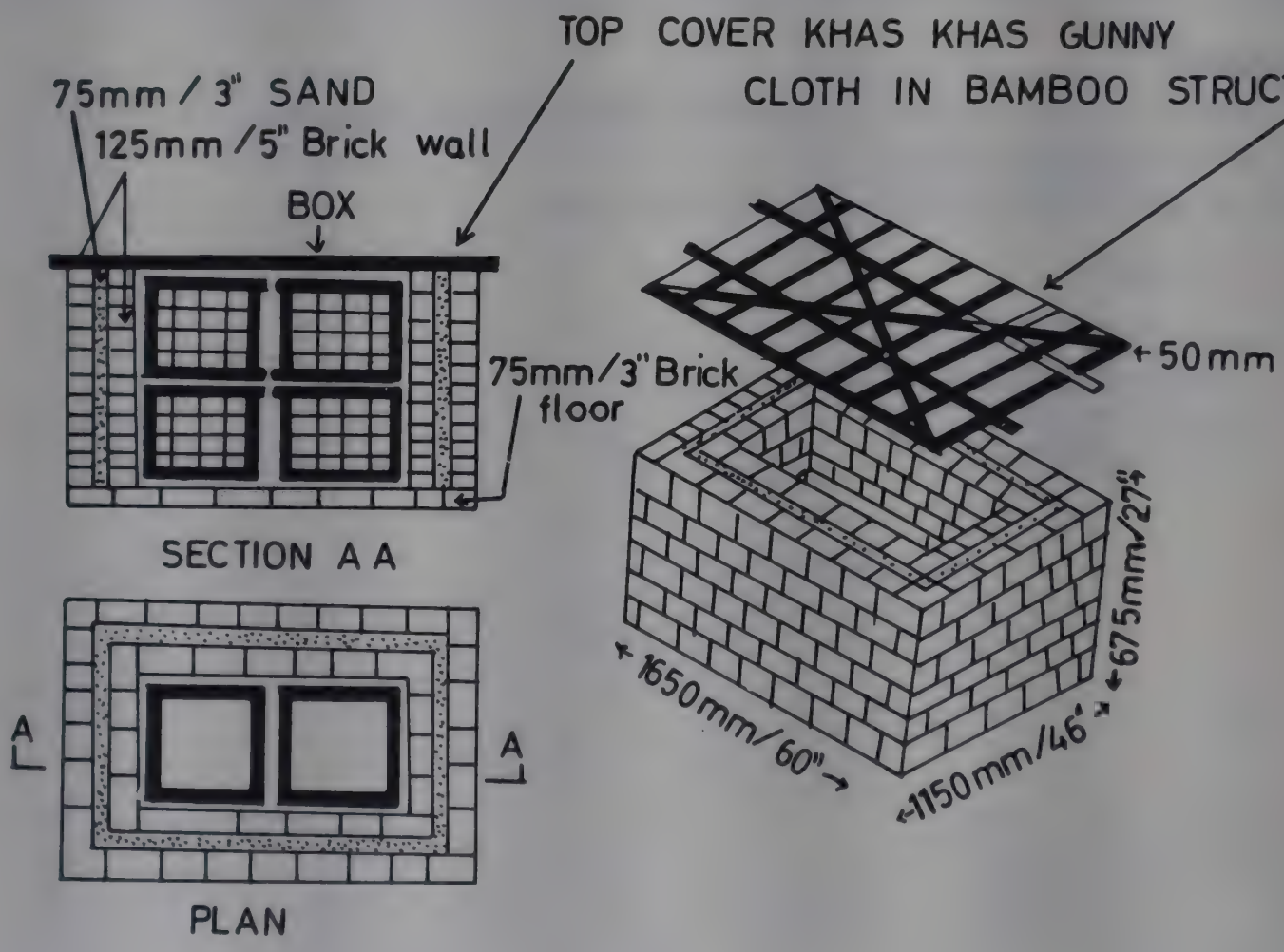
PRECAUTIONS :

1. It is vital to maintain it constantly by filling cracks with cowdung slurry.
2. The silo should always be kept dry.
3. Clean up the bin thoroughly, before filling the grain.

COST : Rs. 300/-

SOURCE : DIRECTOR
INDIAN GRAIN STORAGE INSTITUE
HAPUR - 245 101
UTTAR PRADESH

CHEAP COLD STORAGE



TECHNOLOGY NO. 87

CHEAP COLD STORAGE

DESCRIPTION : This cheap cold storage or Cool Chamber is an inexpensive technology which keeps vegetables fresh up to one week even during the Indian summers. It is made from entirely indigenous materials and local skill.

CONSTRUCTION : Construct the floor of the Cool Chamber with a single layer of brick and the side wall with a double layer of bricks. Fill up the space between the bricks (7.5 cm) with riverbed sand. Cover the chamber top with gunny bags (or 'khas') fitted into a bamboo structure. Saturate the chamber once with water and keep on sprinkling water once in the morning and once in the evening. This is enough to control the temperature and retain the humidity inside the chamber.

WORKING : The cool chamber functions on the principle of evaporative cooling. It does not require energy input as in mechanical refrigeration. The cool chamber has 17 to 18 degree celcius lower temperature than atmospheric temperature during May and June.

COST : Rs. 200/- (approx.)

SOURCE : THE HEAD
DIV. OF FRUITS & HORTICULTURAL TECHNOLOGY
INDIAN AGRICULTURAL RESEARCH INSTT.
PUSA
NEW DELHI - 110 012

COOL FOOD ALMIRAH

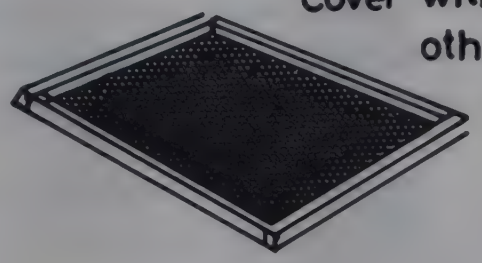


FIG. 1

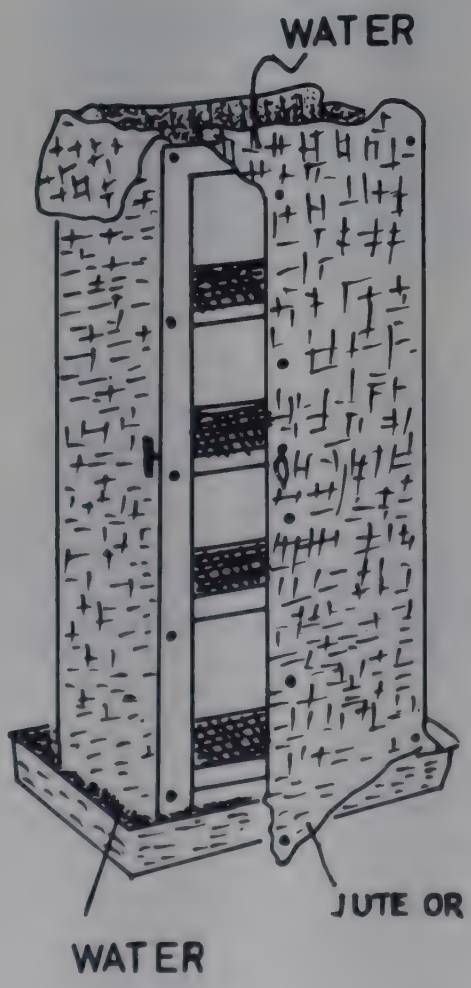


FIG. 3

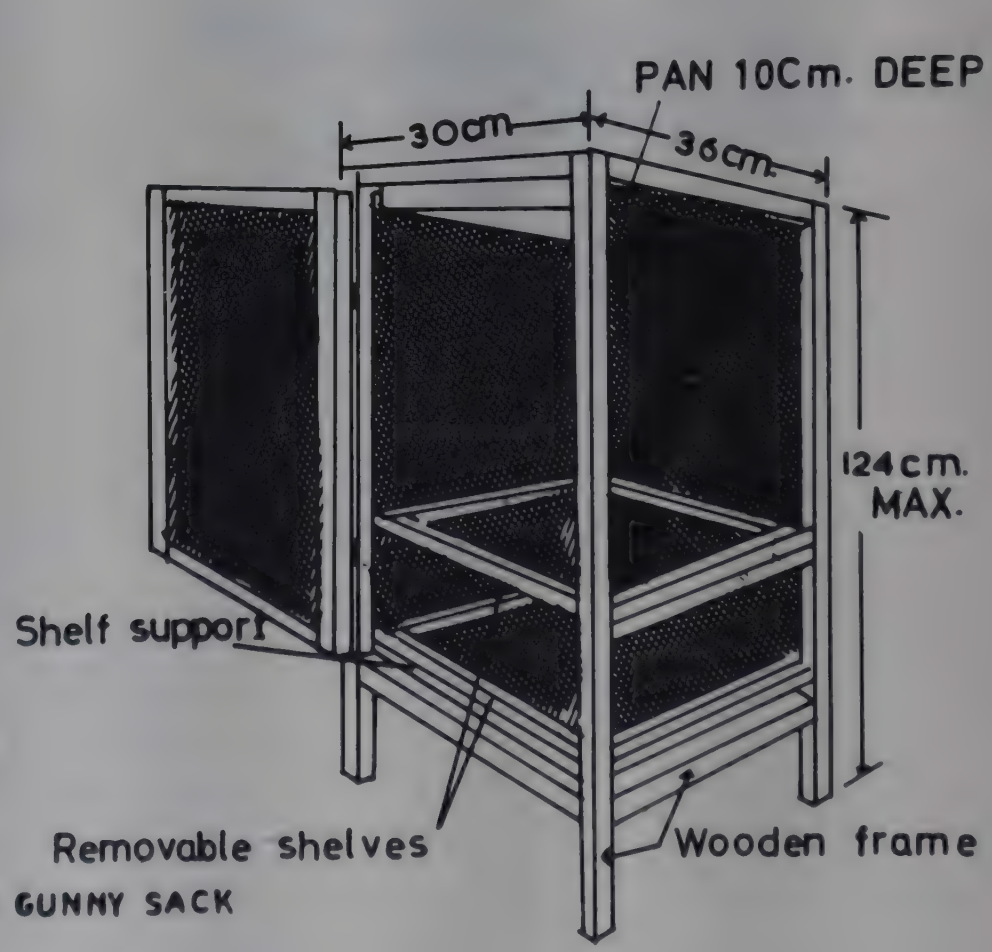


FIG. 2

TECHNOLOGY NO. 88

COOL FOOD ALMIRAH

DESCRIPTION : This Cool Food Almirah keeps milk, fruits, vegetables and cooked food fresh for long periods during hot summers.

MATERIALS : Saw, hammer, nails, burlap (2 metres x 2 metres), wood for frame (3 cm x 3 cm x 13 metres). Top pan (10 cm deep, 24 cm broad and 30 cm long), screen of hardware cloth or galvanized iron (2 metres x 2 metres), hinges (2 pair), and bottom pan (larger than 30 cm x 36 cm) for legs to stand on, and paint.

CONSTRUCTION : Make the wooden frame to fit the upper pan (see Figure 2). This might be the bottom of a discarded 5-gallon oil can. The lip of the pan fits over the top of the frame to keep the pan from falling into the refrigerator. Hinge the door carefully so that it swings easily and make a simple wooden latch. Paint or oil all the wooden parts. The upper and lower pans should also be painted to prevent rust-formation. Cover the shelves (see Figure 3) and frame with screening or hardware cloth and tuck it in place.

Make the shelves adjustable by providing several shelf supports. Flatten the pointed ends of the nails slightly to keep the wood from splitting when it is fastened.

Make two covers of flannel or jute burlap or heavy grade absorbent coarse cloth (gunny sack) to fit the frame. Wash and keep one cover in the sun while using the other. On the front, fasten the cover to the door, instead of the frame. Allow a wide hem to overlap the door closing. To form wicks which will carry water from the pans, into the cover, the top and bottom of the door covers should extend into the upper and lower pans. If the cloth cover does not stay moist, extra pieces of cloth can be placed at the top of the almirah to serve as additional wicks.

WORKING : The cool food almirah is cooled due to the evaporation of water from its cloth cover. The cloth is moistened as capillary action moves water from the pans through it..

COST : Rs 150/- to 200/-

SOURCE : VOLUNTEERS IN TECHNICAL ASSISTANCE (VITA)
1815 NORTH LYNN STREET, SUITE 200
ARLINGTON
VIRGINIA 22209
U.S.A.

TECHNOLOGY NO. 89

VILLAGE FOOD COOLER

DESCRIPTION : This bamboo cooler is an economical rural refrigerator which keeps vegetables, fruits and other food fresh for long periods in hot climates.

CONSTRUCTION : Take 4 bamboos with a diameter of 17 cm. Cut the bamboo 120 cm lengthwise for the legs. Cut square holes near the bamboo joint in each section (to make them longer). Cut 4 more pieces of bamboo which are 60 cm long and four more, 50 cm long. Split these 8 pieces in half, lengthwise. Smooth the edges of the long and short pieces of split bamboo. Then cut 5 cm from each end (Figures 1 and 2)

Put the bamboo pieces at an angle into the holes of the legs of the cooler. Then twist them to make them flat and strong. Put wooden pins or wedges into each joint (Figures 3 and 4). Lay small split bamboo pieces across each other and tie them to form 3 racks (50 cm x 40 cm). See Figures 5 and 6. Set these racks inside the frame.

Weave split bamboo pieces to make the back and side walls of the cooler and tie these walls in place with bamboo string. Make the top and bottom containers from galvanised sheet metal (the best is 32 gauge) or from clay. Bend 15 cm from the edge. (Figures 7 & 8). Fold the corners. (The back portion is cut out and not used.)

Follow the above directions, wring the 2 cm around the edges to hold the tray in position. Set the top and bottom containers in place. Use a jute bag (or a burlap sack) or even flannel material for the outside covering of the walls. This material absorbs water from the containers. (The material is stitched, tied or nailed into place).

WORKING : Fill the two containers with water. The water is absorbed by the material and the walls become wet. The jute is touching the water in the two containers (Figure 9). The cooling process takes place due to the content evaporation — occuring at the same rate.

PRECAUTIONS :

1. Keep the cooler in a breezy spot in the shade during dry climate.
2. Keep it always clean.
3. Keep changing the water every third day to prevent bad odour and mosquitoes.

COST : Rs. 150/-

SOURCE : VITA
3706 RHODE ISLAND AVENUE
MOUNT RAINIER
MARYLAND 208 82
U.S.A.

EFFICIENT MOUSE TRAP

TECHNOLOGY NO. 90

EFFICIENT MOUSE TRAP

DESCRIPTION : Rats are a big nuisance both for the crops as well as the households. To get rid of this rat menace, a simple and efficient mouse-trap could be constructed as given below. As a matter of fact, it is not just a low-cost technology but, literally, a no-cost technology.

CONSTRUCTION : Dig a pit about 1.5 to 2 feet deep and broad enough to accomodate a clay pitcher. Fit the pitcher into this pit in such a manner that everything is covered but for its open mouth. Make some home-made glue (from rice etc.) and fill the pot upto the brim or ground level. Spread some granular food item around the pot hole.

WORKING : The rat gets attracted to the food and falls into the glue pot. The rat is not able to extricate himself out of the sticky substance and dies in the process.

SOURCE : SERVICE DEPARTMENT
DE L'AGRICULTURE
NIAMEY
NIGER
WEST AFRICA

III.

DRINKING WATER & SANITATION TECHNOLOGIES

- **Drinking Water**
- **Sanitation Facilities**

TECHNOLOGY NO. 91

WATER FILTER CANDLE

DESCRIPTION : A great number of people in Rural India are suffering from water-borne diseases stemming out of uncelar drinking water. Water filter candles ensure clear, germ-free drinking water.

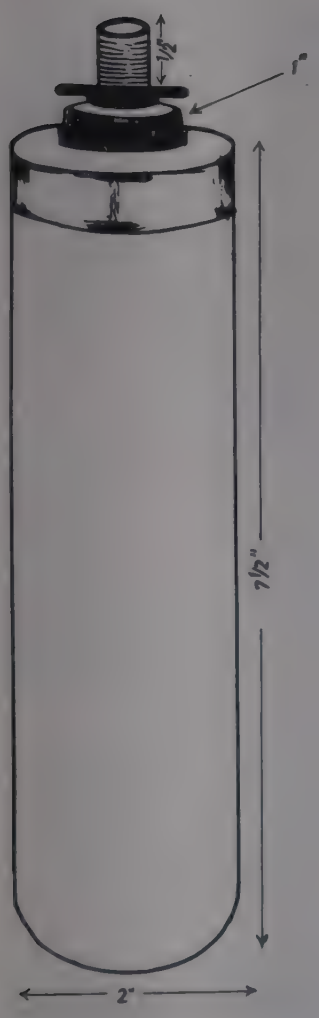
CONSTRUCTION : The candle is constructed by first mixing non-plastic materials like quartz and felspar with china clay, plastic clay and some other combustible materials in requisite quantities and required fineness. A casting slip is prepared by adding electrolytes and then put into plaster of paris moulds. the finished product is then baked at a suitable temperature and given a special chemical treatment before the filter candle is marketed.

WORKING : Once the candle is constructed, it is fitted into the bottom of a vessel containing water by making a hole in the container and fixing the candle on it with the help of washers. Fill up the container with unclear water. The filtered water collects in a receptacle below, to which a tap is attached for easy excess.

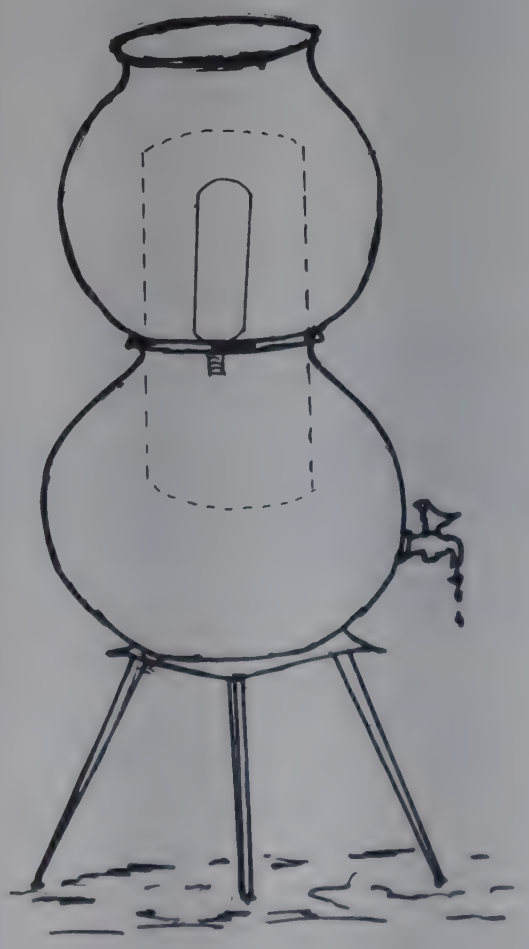
ADVANTAGES : 1. These candles can be easily fitted inside earthen pots or clay pitchers to reduce the cost. 2. It saves the energy spent in boiling the drinking water.

COST : A good quality water candle costs between Rs 50 to 60.

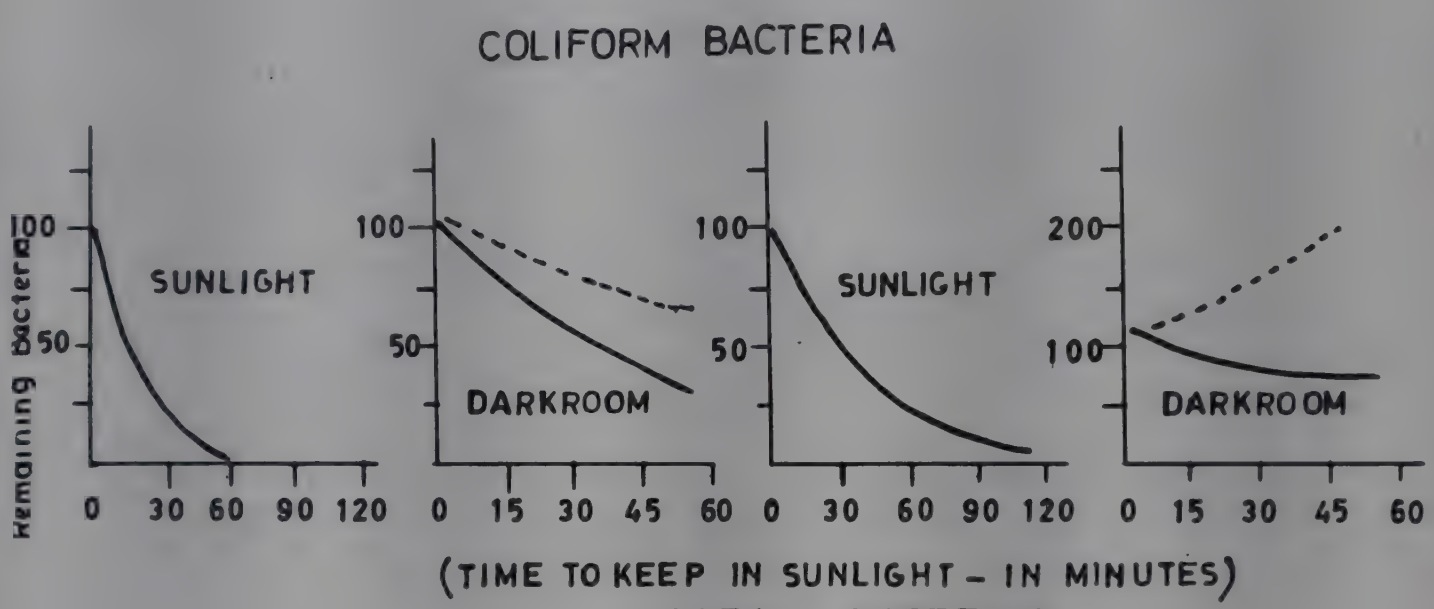
SOURCE : CENTRAL GLASS & CERAMIC
RESEARCH INSTITUTE,
P.O. JADAVPUR UNIVERSITY
CALCUTTA - 700 032.

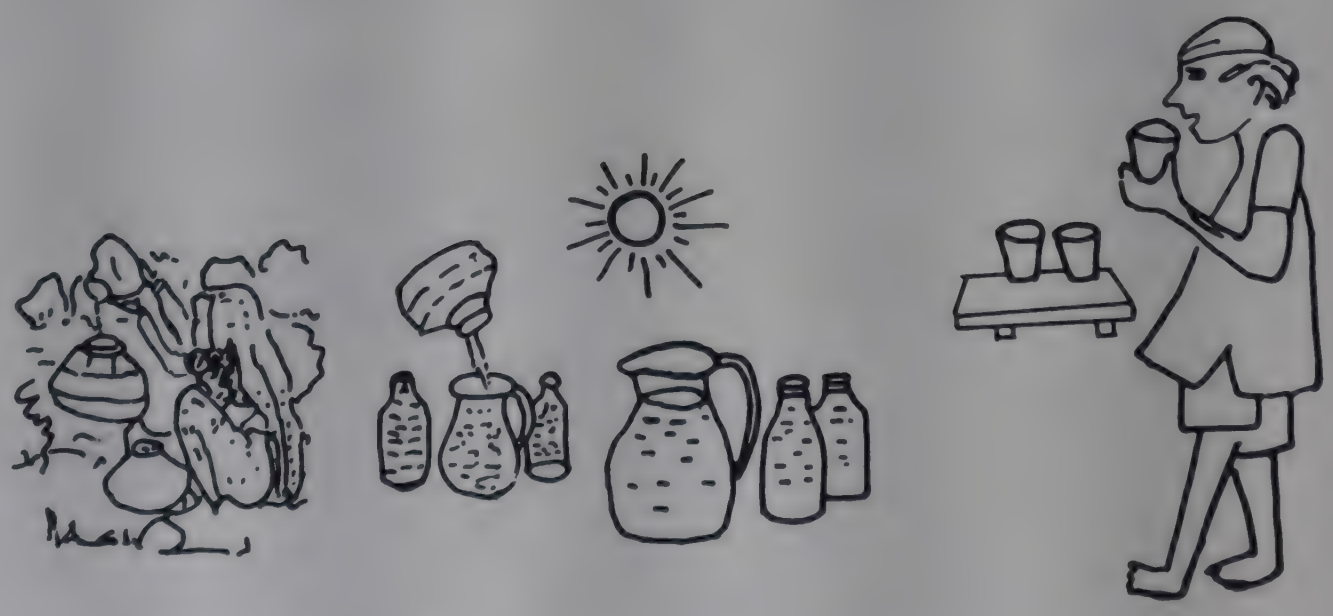


WATER FILTER CANDLE



SOLAR DISINFECTED WATER





TECHNOLOGY NO. 92

SOLAR DISINFECTED DRINKING WATER

DESCRIPTION : Solar disinfection of drinking water is a no-cost, efficient technology which kills 99.9% coliform bacteria in 95 minutes. Not only this, if you keep the solar disinfected water inside the room and check again for bacteria formation - you won't find any. Hence rural women must utilize this technology wherein no fuel is required and the only source of energy i.e. the sun is available for 300 of the 365 days in a year.

MATERIALS : Vessels made of transparent plastic or colourless glass (or even slightly blue-tinged glass).

WORKING : UNICEF has conducted various studies which reveal that water form the village well, pond or river could be cleansed off the coliform bacteria by simply exposing it to the sun, as shown by the graphs on the opposite page.

To begin with, sediment the water taken from the well by leaving the container for some time so that heavy dust or dirt particles settle at the bottom. Now, pour this sedimented water into vessels made of transparent plastic, colourless transparent glass, or blue-tinged glass. Now, keep these water-filled vessels out in the open where there is a total exposure to the sun. See that the place is dust-free for optimum results. Keep the vessels slightly away from each other for direct radiation from the sun.

These vessels could be covered with a lid, though it is not very essential, if the place is clean enough, for sun-drying purposes. Actually, water kept in covered glass vessles becomes pretty hot as compared to the water kept in uncovered vessels.

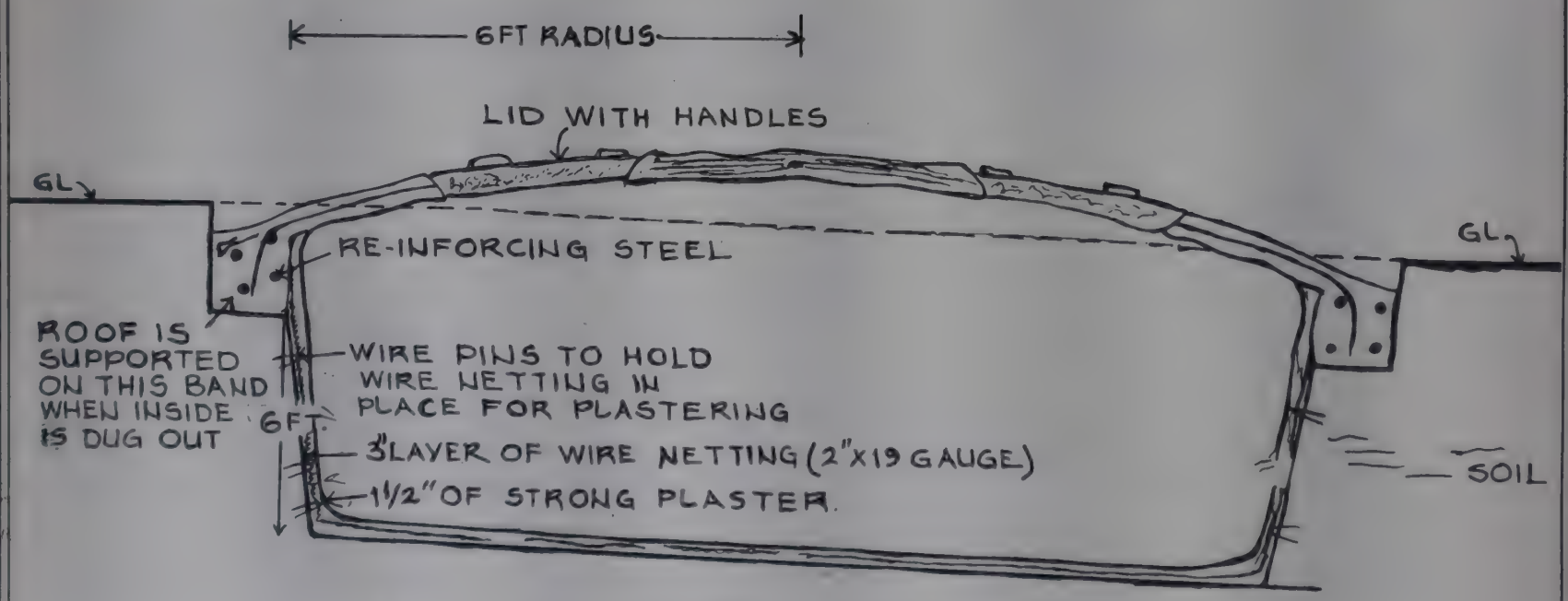
You can keep these vessels out in the sun early in the morning and let them remain so till late in the afternoon. This solar disinfected water could either be used directly or kept overnight for cooling it down.

SOURCE : UNICEF
55 LODI ESTATE
NEW DELHI-110 003

LOW COST WATER TANK

DOME OF UNDERGROUND TANK BEING PLASTERED BEFORE EXCAVATION.

TOP VIEW



SECTION OF UNDERGROUND TANK

TECHNOLOGY NO. 93

RAIN WATER HARVESTING TANK

DESCRIPTION : This is a 4,000 gallon capacity semiferrocement tank, sutable for collectiing rainwater drained from the roof of a large public building. The basic technique can be scaled up or down to meet the particular requirement.

MATERIALS : A 4,000 gallon capacity tank of 12 feet inside diameter and 6 feet depth requires one ton of cement, 200th of 2 inch wire mesh wire-netting and either a coil of No. 8 galvanised fence wire, or 8 lengths of Half inch steel and 20 lengths of one fourth inch steel rod.

CONSTRUCTION : Choose a spot where the gound is soft, and dig a circular trench 12 feet in diameter, and 12 feet deep. Throw the soil from the trench into the centre and pat it into a suitable dome shape. Make a concrete mix of 6:1 (aggregate:cement) and pour it into the trench. space horizontally 4 x ½ inch steel rods with plenty of overlaps to make a reinforced band of concrete in the trench (Fig.1). Then, continue this up over the central dome with a half inch layer of 3:1 (sand:cement) mix, spread over the soil to give complete coverage, except for two diametrically opposite circular patches. The patches should be of 24 inch diameter and they will form the access portholes (Fig.2). Lay three layers of 2 inch mesh-wire netting over the cement, with a series of one fourth inch reinforcing rods, spaced 2 inches apart at the edge, the outer ends bent over and pushed into the reinforced outer band and the inner ends meeting at the centre of the dome. Plaster over the entire top to make a uniform 2 inch thick layer over the dome, integrated with the outer reinforced band.

Extra circles of steel rods are required around the thickened edges of the portholes, which are hand-moulded with a 45 degree inclination. A sheet of plastic, usually the liner from a cement bag, is laid over the levelled lip of the porthole and the liquid is pured into the basin thus made, with suitable handles set into the mix. After three or four days, the lids are lifted off and the ground is dug out underneath the dome as far as the inner edge of the reinforced band and to a depth of 6-8 feet with a slight taper on the sides, like that of a bucket.

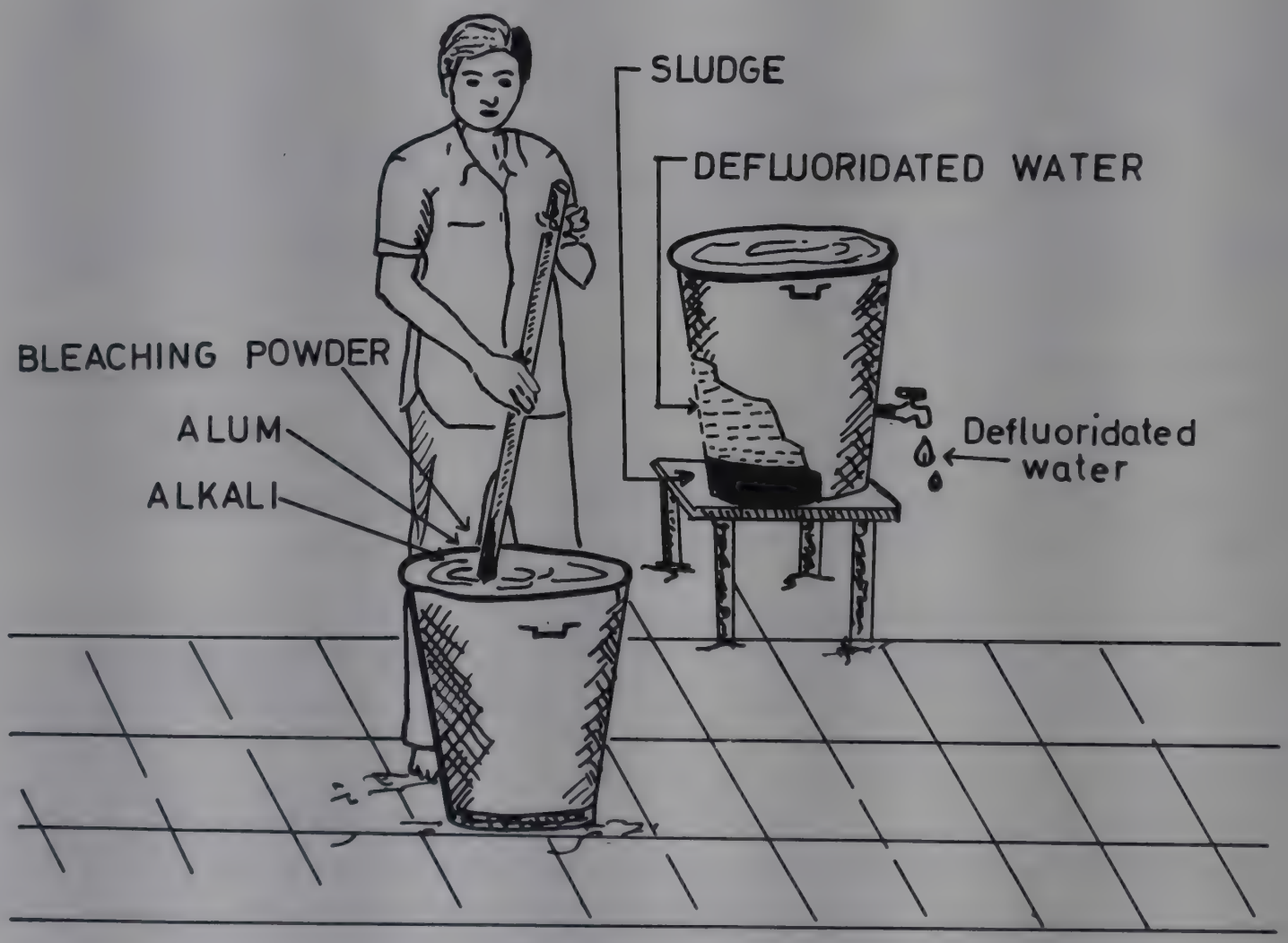
To build up the interior walis, the 'splash' technique is used. A thick 2:1 (fine sand:cement) soupy mix is held in a shallow bucket or basin and flicked or dashed against the smooth earth wall with the point of a trowel. After the first thinly splashed layer is allowed to stiffen for half an hour, further applications are made to build up a rough cast of ½ inch thick coating of plaster, which is allowed to set for one or two days. Then, the wire netting (three layers) and No. 8 wire-reinforcing are fastened to the wall, using 6 inch lengths of wire bent into U-shaped pins and forced through the plaster into the earth behind. Then the walls are plastered with several coats to bring them out to a total thickness of one and a half inch. The plaster extends up over the reinforced band on to the roof and is intergrated with the floor, which is made up from plaster and the droppings from the walls, with wire netting reinforcement (Fig.3). A final waterproof finish coat can be made from a proprietary mix such as Silasec or Febseal or a good home-made sealing solution can be made from 73% water, 26% calcium chloride and 1% Sodium Silicate (Waterglass). Paint the inside of the tank with three coats of the following mix, using this preparation:

1 Gallon sealing solution (as above), 2 Gallons of Water and half bag of portland cement.

COST : Rs. 3500 to 4000/-

SOURCE : REV. K.C. CALVERT & R.J. BINNING.
CHRISTIAN INSTITUTE OF TECHNOLOGY
WEASISI, KITOW, NEW HEBRIDES
SOUTH PACIFIC.

NALGONDA DEFLUORIDATION



DEFLUORIDATION ON DOMESTIC LEVEL

TECHNOLOGY NO. 94

NALGONDA DEFLUOURIDATION

DESCRIPTION : It is an extremely simple and effective water-purification technology which is not only low-cost but also very appropriate for rural women who have to trek a long way in search of clean potable water.

MATERIALS : Lime, soda-ash or sodium-bi-carbonate (any of the alkalis), alum and bleaching powder.

CONSTRUCTION : Add an alkali (lime, soda-ash or sodium bicarbonate), alum and bleaching powder to the water in any container. Fix a tap about 4 inches above the bottom of the container (even a mud pitcher would do).

WORKING : Pour water in the container and add all the chemicals in adequate quantities. Stir the water for about ten minutes. The coagulant formed will settle at the bottom of the container. Open the tap after one hour to get flouride-free drinking water. Discard the sediment.

COST : It costs less than a Rupee for treating 50 litres of raw water.

SOURCE : NEERI
NEHRU MARG
NAGPUR - 400 020
MAHARSHTRA

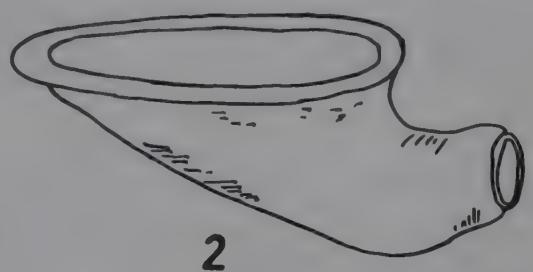
WATER PURIFICATION FORMULAE: 2% Tincture of Iodine:
If water is clear, add 5 drops* per litre.
If water is cloudy, add 10 drops per litre.
Let water stand still for 30 minutes before using.

OR

Chlorine (4 to 6%, which is the usual strength of household chlorine bleach)
If water is clear, add 2 drops per litre.
If water is cloudy, add 4 drops per litre.
Stir or shake and let it stand still for 30 minutes.
If the water smells of chlorine, let it stand for another 30 minutes before using.
(* I drop = 0.5 ml)

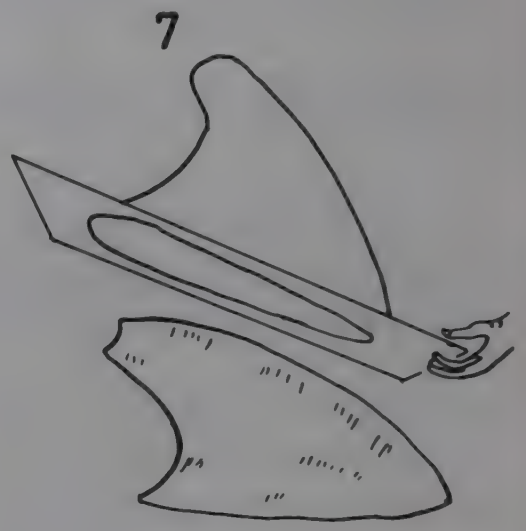
RASULIA WATER SEALED TOILET

1



2

PLATE



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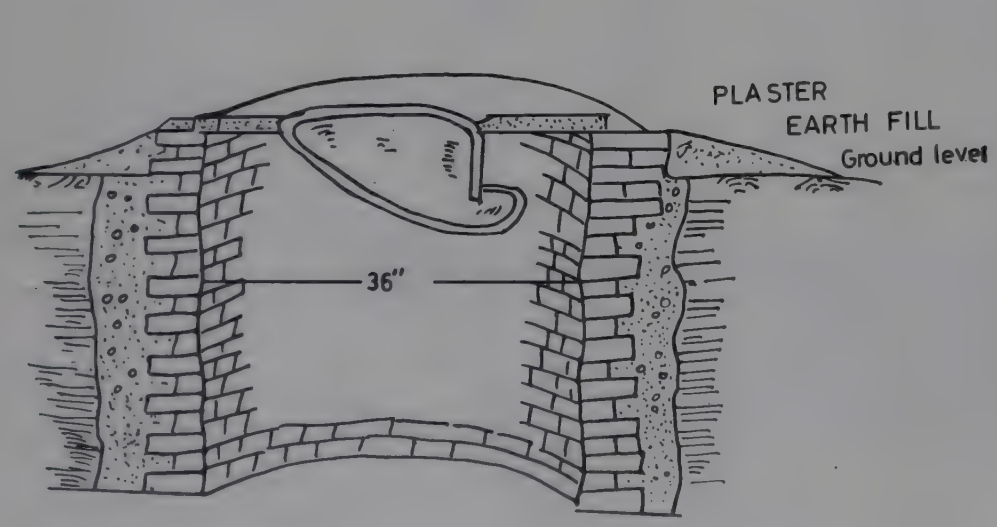

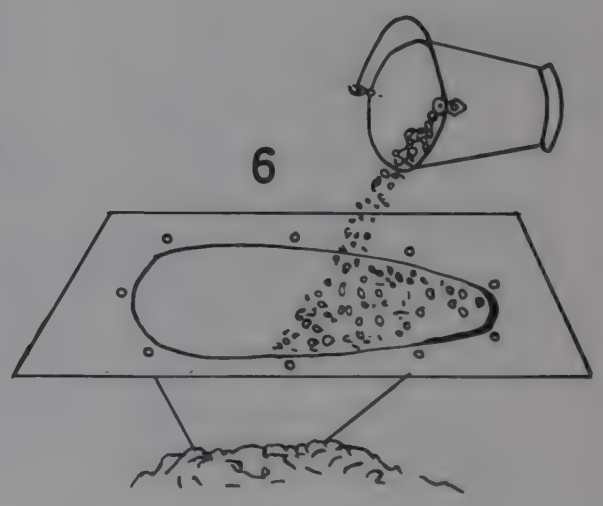

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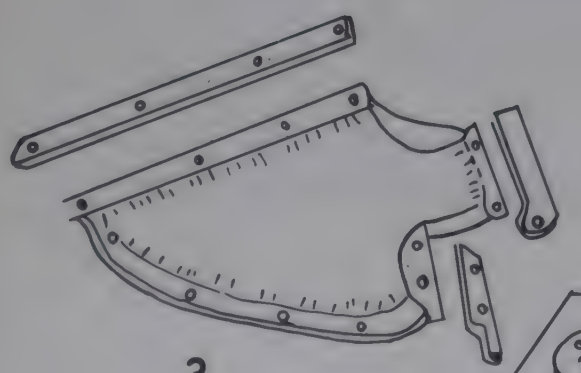

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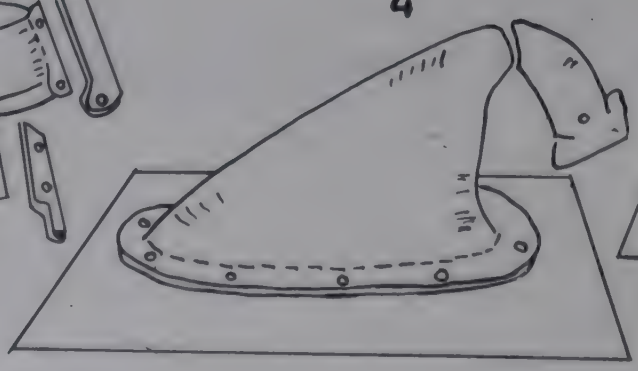

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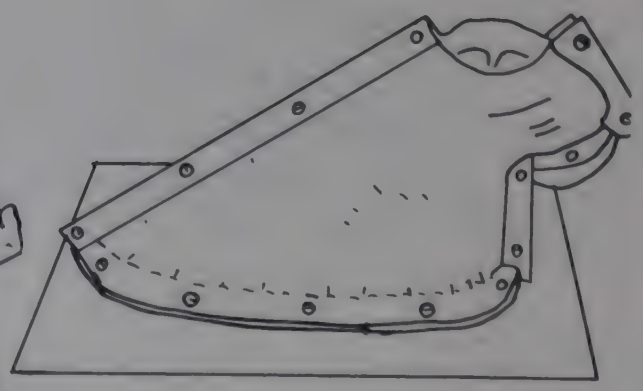


TECHNOLOGY NO. 95

RASULIA WATER SEALED LATRINE

DESCRIPTION : Rasulia water-sealed latrine is an effective, low-cost, technology which is well-suited for sanitation purposes in the rural areas. It is very easy to fabricate using local materials and local skill.

CONSTRUCTION : Two types of pans are constructed with Rasulia plastic moulds: 1. The standard water seal pan is intended for mounting directly over the digestion pit (see figure 1). This may be done using the method given below. 2. Special water seal pan with pipe spout (see figure 2) is intended for connecting to a digestion pit, by a pipe, outside the building. A more or less permanent latrine installation is done as shown in the figure 3. Standard Rasulia pan is fixed on top of a 'pucca' brick lining. A space between brick lining and the undisturbed soil is filled back with brickbats, stone-chips and cinders. The pit is dug about 5 feet in diameter. It is lined up to a diameter of 3 feet and the plaster/mortar is used only above the level. (see illustration).

PLASTIC MOULD : The outer part is made from two moulded pieces of plastic which are permanently fastened together, with a piece of folded plastic strip down the sloping side and bolted on with roofing bolts (see figure 3). Two similar, smaller, strips along the opposite side complete the outer mould. These two strips could be removed while using the mould.

The inner part is also made from two parts - the 'bowl' and 'trap', respectively. (see figure 4).

The inner and outer parts of the mould are held together in their proper relationship by 12 roofing bolts - 10 along the bottom rim of the 'bowl', and 2 through the base of the 'trap' (see figure 5).

If the inner mould is used without additional support it would sag and get disturbed. It is, therefore, recommended that for each mould in use, a stiffner should be cast in the following manner:

Remove the larger 'bowl' part from the mould and lightly oil from inside with some cooking oil. Fix it in sand in a horizontal position (as shown in figure 6). Mix about 9 litres of concrete using one part of cement to two parts of sand and three parts of ¾ inch thick stone chips, and mix with enough water to give a plastic consistency. Fill the hollow of the mould completely with this mixture upto the rim level and vibrate it a little to remove ash bubbles.

Allow this to set for at least 24 hours. Remove the 'stiffner' casting by inverting the mould and lifting it off carefully (see figure 7). A little tapping may be needed to get it separated.

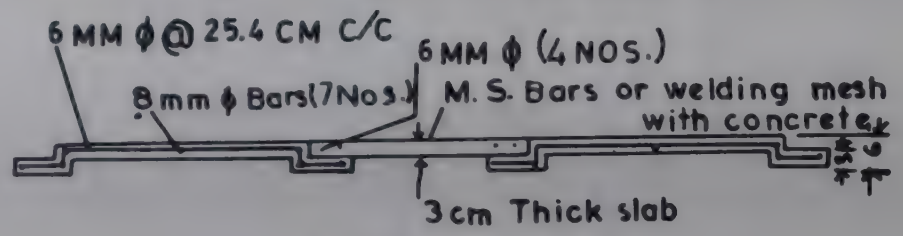
PRECAUTIONS : This 'stiffner' is subsequently used under the inner mould whenever latrine bowls are being cast. So, if only one or two bowls are to be cast at a site, avoid making the stiffner. The hollow may be filled with stiff clay. This clay must be removed before the inner form is removed from the casting.

COST : Rs. 50 to 75/-

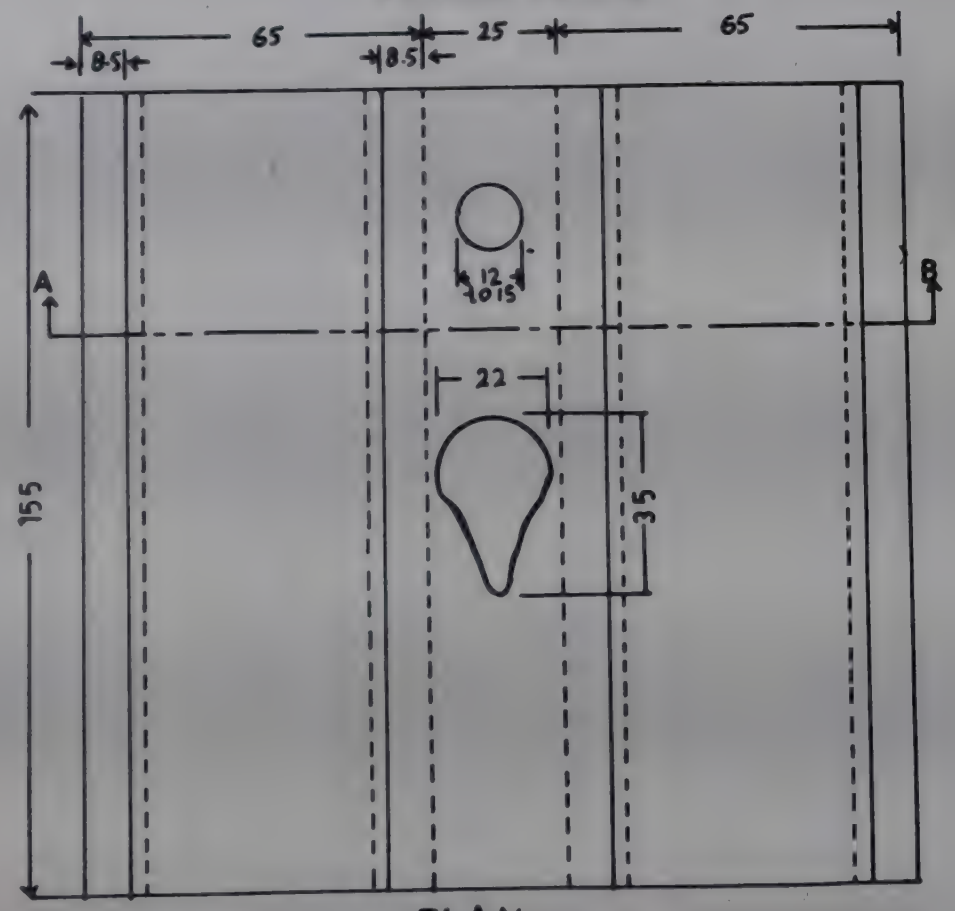
SOURCE : FRIENDS RURAL CENTRE
RASULIA
HOSHANGABAD
MADHYA PRADESH

THAPOLY RURAL LATRINE

DETAILS OF R.C.C. CHANNEL & SLAB

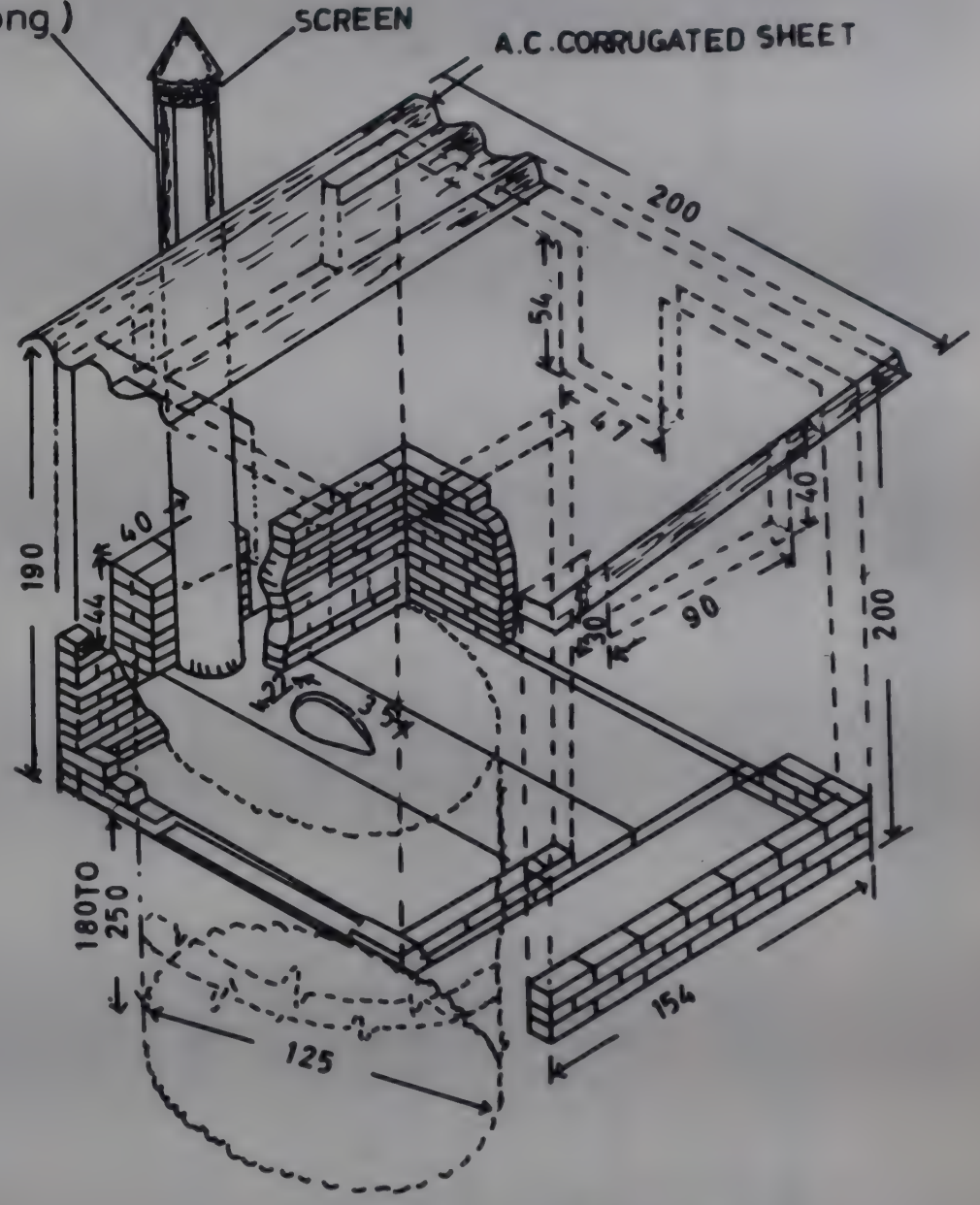


SECTION AT A-B



PLAN

Flue pipe 12 to 15 ϕ (3m long)



All dimensions in cm.

TECHNOLOGY NO. 96

THAPOLY RURAL LATRINE

DESCRIPTION : Majority of the rural folks go out to the fields for easing themselves. This poses a grave problem for women who can only venture out in darkness - which is very unsafe. Thapoly Rural Latrine solves this problem by being low-cost, hygienic and requiring minimum place for erection purposes.

CONSTRUCTION : The Thapoly Rural Latrine comprises a R.C.C. slab placed over a deep pit. The central piece of the slab has two openings: one squatting hole and a vent hole. (The construction details are shown in the illustrations on the opposite page.)

The vent hole is outside the supper structure and fitted with a fluepipe, 150 cm in diameter and about 3 metre high. The pipe should be painted black and be located on the sunny side of the super structure. The upper part of the pipe is cone-shaped and opens out to 200 mm. The opening is covered with flyscreen.

WORKING : Temperature difference between the inside and the outside of the pipe will cause a convection updraught, drawing air and gases from the pit and thus causing a downdraught through the squatting hole. Flies from outside are attracted to the odours passing up the pipe and are said to avoid the interior of the superstructure. As the flies cannot enter the pit via the fluepipe, flybreeding in the pit is reduced. Flies breeding in the pit are attracted by the light at the top of the fluepipe and trapped there by the screen. Eventually, they die there and fall back into the pit. When the pit is filled out, a new latrine can be built by digging a pit and shifting the slab.

PRECUATIONS : 1. Use minimum quantity of water to maximise the life span of the latrine. 2. Do not close the hole in the slab with any cover. 3. The superstructure must darken the squatting hole sufficiently for the flies inside the pit to be attracted by the light at the top of the fluepipe. 4. Keep the latrine thoroughly clean.

ADVANTAGES : 1. Saves the trouble of venturing out in dark or in a rainy season or even if someone is sick. 2. Does not emit foul smell. 3. Economical and no maintenance cost. 4. Provides you with a pit full of rich manure after 5 or 7 years. 5. It prevents the spead of diseases.

COST : Rs.400/- (approx.)

SOURCE : COMMUNITY POLYTECHNIC WING
THAPAR POLYTECHNIC
THAPAR INSTITUTE OF ENGINEERING &
TECHNOLOGY PATIALA-147 001
PUNJAB

IMPROVED VENTILATED PIT LATRINES FOR RURAL AREA

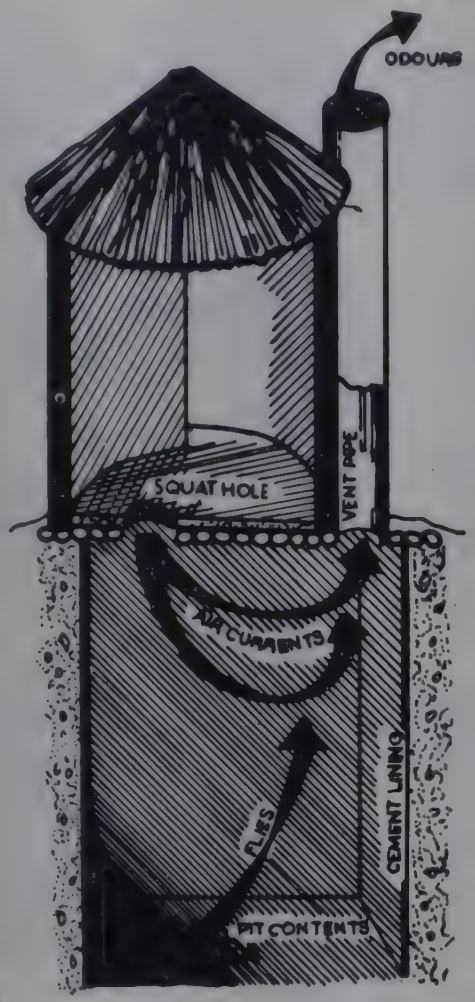


Fig-1

Air flow and fly movement in a V.I.P.

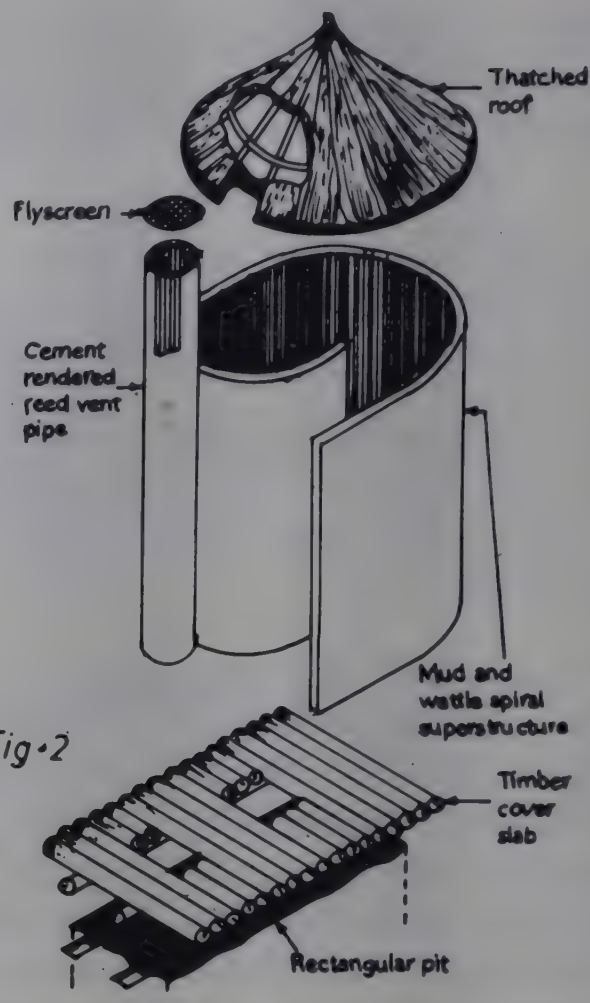
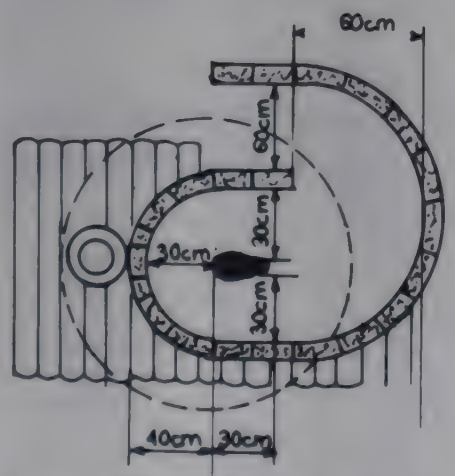


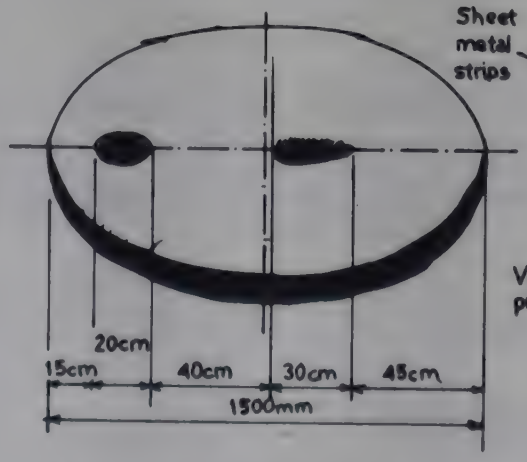
Fig-2

Expanded schematic diagram of VIP latrine made from local material



Arrangement of bricks in a spiral superstructure & vent pipe over a long base

Fig-3



Measurement for the 1·5m dia. concrete slab.

Fig-4

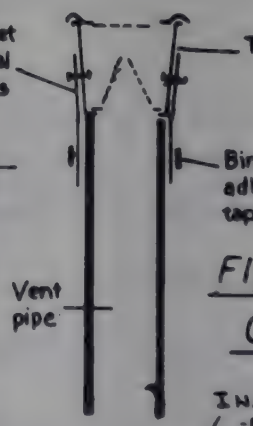


Fig-5

Fly trap On vent pipe

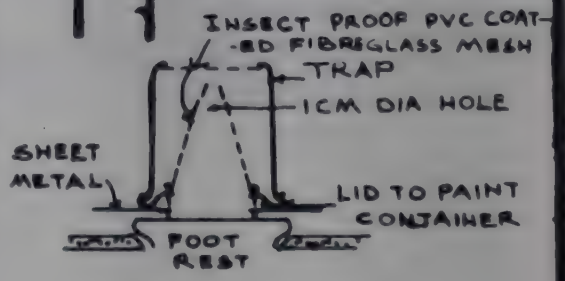


Fig-6

Fly trap Over squatting plate.

TECHNOLOGY NO. 97

VENTILATED IMPROVED PIT LATRINE

The VIP latrine is easy to construct and maintain. It is free of foul odour and flies.

DESCRIPTION : Ventilated Improved Pit Latrine consist of a pit dug in the ground, a base slab covering the pit, a superstructure including a roof and an efficient ventilation pipe fitted with a corrosion-resistant flyscreen. The pit is protected against collapse by a collar at its rim, made with cement or bricks. This also helps to prevent surface-water erosion and provides a foundation on which to build the superstructure. The base slab is built with two openings, one for the ventilation pipe and one for the squatting hole. The superstructure is designed to provide semi-darkness and is commonly built in a spiral, doorless, shape around the squat hole.

The opening of the structure should preferably face north or south, to prevent the morning or afternoon sun from penetrating the interior and thus attracting flies. If possible, the opening should face the prevailing wind as this aids ventilation. In most designs for rural use, the roof is made from thatch. Ventilation pipes can be made from many materials including PVC, asbestos, brick, and plastered reeds. The pipe should be fitted with corrosion resistant screens made of materials such as fibreglass, as exhaust gases are very destructive. Since fresh air is always passing down the squatting hole, foul air from the pit cannot pass into the structure, which should remain almost odourless. Any flies about to fly out of the pit seek a light-source and, as the structure is in semi-darkness, will be attracted to the light showing through the top of the pipe. They fly to the screen where they are trapped and eventually die (Fig. 1).

These fly traps can be placed over latrine apertures, or on top of vent pipes, where insects are funnelled into the trap by a cone of netting and then find it difficult to escape (Fig. 5).

MATERIAL : This technique requires one bag of cement, timber, grass for thatching, mud, wire and a flyscreen.

CONSTRUCTION : Once a suitable site has been chosen, a rectangular hole is dug in the ground 1.5 m long, 0.6 m across and 3 m deep. Once the pit has been dug, the sides and rim are plastered with a mixture of one part cement to eight parts sand.

The cover slab can be made of logs. Apertures of the vent pipe and squat hole are formed at the appropriate places by using pairs of shorter logs extending to the inner edge of the longitudinal logs (Fig. 2). The timber base is embedded into the mortar around the rim of the pit.

The superstructure can be built using either burnt bricks or sun-dried mud bricks (Fig. 3).

A traditional roof is then made with thin poles and thatch, leaving a recess in position for the pipe (Fig 2). The entire roof is wired on to the structure's framework and the inner and outer walls are plastered with mud.

The latrine floor should slope from all directions towards the squat hole (cement is used to plaster the floor of the latrine and the ventilation pipe (Fig. 4).

Vent pipe should be 150 mm in diameter and 2.5 m high. This is fitted on to the latrine floor, over the sealed pit. Efficiency is increased by painting the pipe black and facing it where most sunlight falls. The upper end of the pipe is fitted with a fly-screen (Fig. 5).

The pipe base is fixed in position and its upper-end is wired to the superstructure.

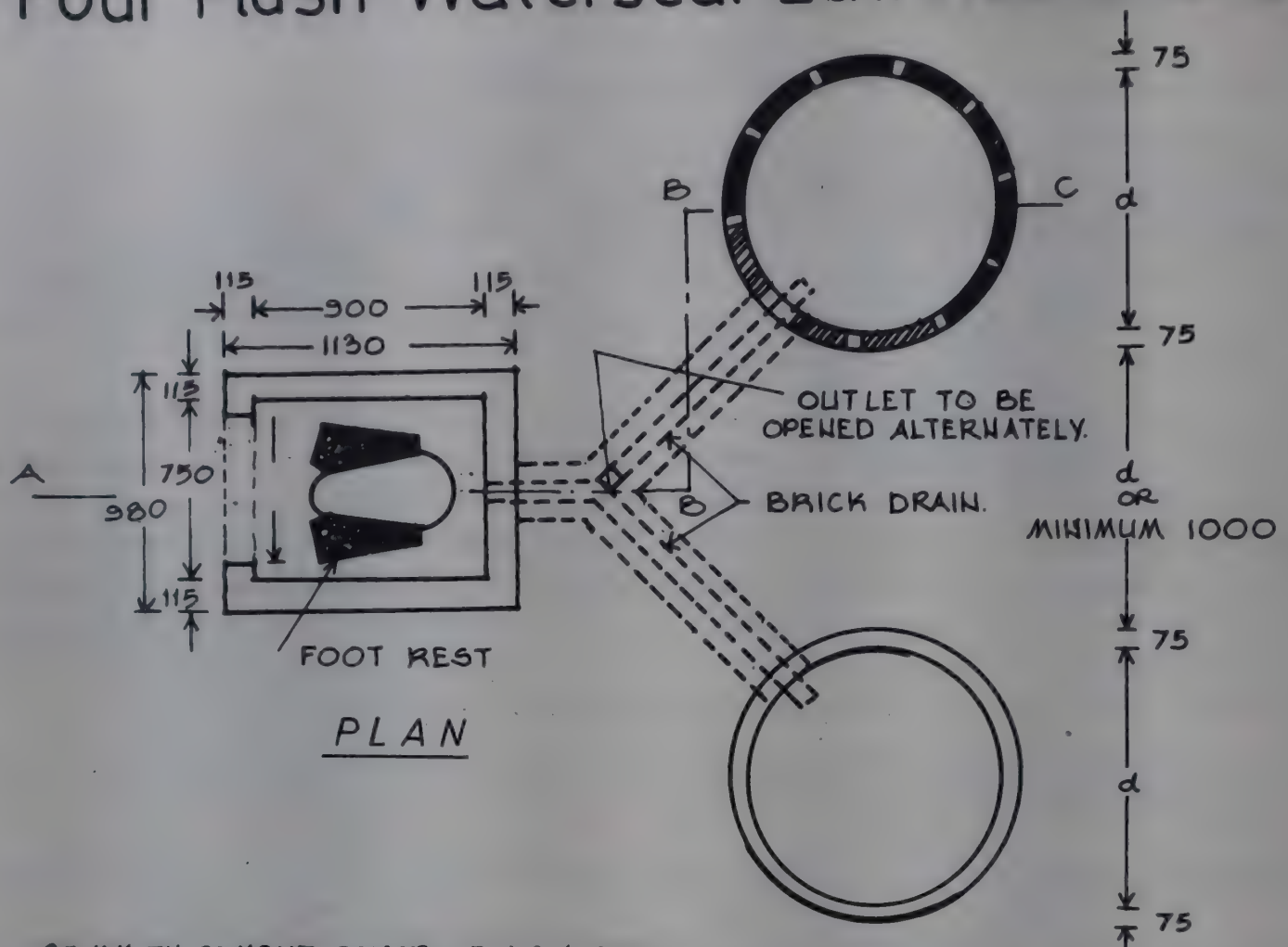
Any exposed part of the slab is covered with soil and sloped away from the latrine. Grass can be planted to further protect against erosion by rain. If bitumen can be afforded, a thick layer may be laid over the cement floor to prevent the absorption of urine by the cement.

A smoke test is applied to the latrine. This involves lighting a small fire, with grass, in the pit. The smoke should rise out of the vent pipe, and the interior of the latrine should remain smoke-free. This clearly indicates the passage of air through the system.

COST : Rs. 600/-

SOURCE : PETER MORGAN & EPHRAIM, CHIMBLINDE
BLAIR RESEARCH LABORATORY
HARARE, ZIMBABWE

Pour Flush Waterseal Latrines in India



TECHNOLOGY NO. 98

POUR-FLUSH WATERSEAL LATRINE

DESCRIPTION : The pour-flush watersealed latrine consists of a squatting pan with a steep bottom slope (25 to 30 degrees to the horizontal) and a 20 mm water seal trap, set in a cement concrete floor. After use, it is hand flushed by 1.5 to 2 litres of water. The excreta is carried through a pipe or drain into two honeycomb leach pits, which are used alternately. The liquid in the pits percolates into the sub-soil where gases are absorbed by the soil, leaving the solids behind. Each pit is designed to last for about three years before it gets completely filled. When one pit is full, it is closed and excreta is then diverted to the second pit. In two years time, the contents of the filled pit turn into a rich organic manure which is safe for handling. This empty pit can be used again, once the second pit is filled to the top.

MATERIAL : For construction of latrine for 5 to 10 users (minus the super structure):

Bricks 600; Cement 3.30 bags; Local sand 0.45 cum; Coarse Sand 0.10 cum; Brick Ballast 0.20 cum; Stone Ballast 0.17 cum; M.S. bars 8.00 kg, labour (10 man-days work).

COST : Rs. 1000/- (The super structure costs Rs. 700/- and thus the total cost comes to Rs. 1700/-)

SOURCES :

1. PLANNING, RESEARCH-CUM-ACTION DIVISION (PRAD)
   KALA KANKAR BHAWAN
   LUCKNOW
   UTTAR PRADESH.

2. ALL-INDIA INSTITUTE OF HYGIENE AND PUBLIC HEALTH
   CALCUTTA
   WEST BENGAL

3. RESEARCH CUM ACTION PROJECTS
   POONAMALLEE, MADRAS
   TAMIL NADU

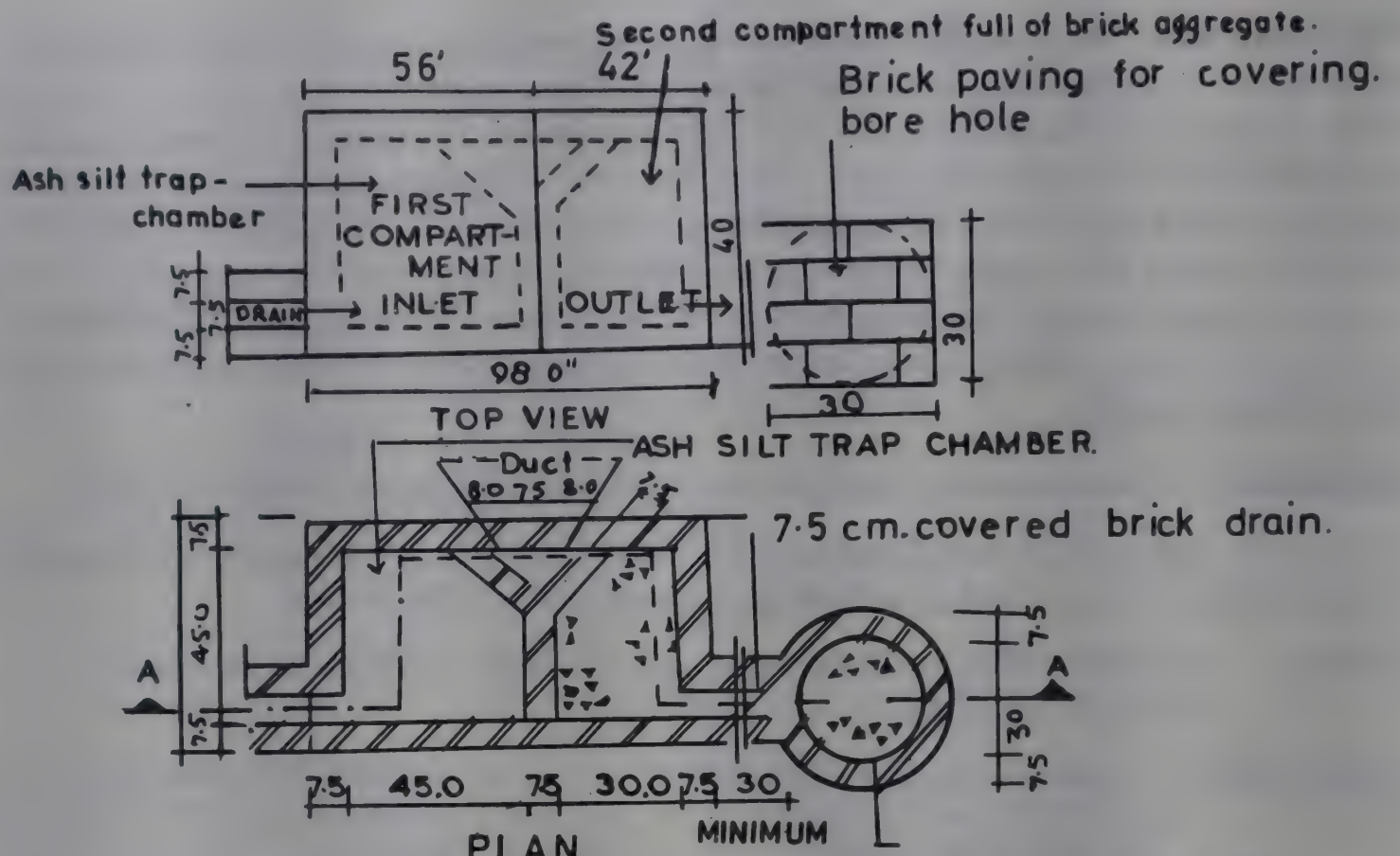
4. CENTRAL BUILDING RESEARCH INSTITUTE (CBRI)
   ROORKEE
   UTTAR PRADESH

5. NATIONAL ENVIRONMENTAL ENGINEERING RESEARCH INSTITUTE
   NAGPUR
   MAHARASHTRA

6. INDIAN COUNCIL OF MEDICAL RESEARCH (ICMR)
   RING ROAD
   NEW DELHI - 110 049

7. UNDP INTER REGIONAL PROJECT,
   WATER SUPPLY & URBAN DEVELOPMENT DEPARTMENT, THE WORLD BANK,
   1818 H. STREET, N.W.,
   WASHINGTON D.C.20433
   U.S.A.

WASTE WATER DISPOSAL SYSTEM



All dimensions in cms.

TECHNOLOGY NO. 99

WASTE WATER DISPOSAL SYSTEM

DESCRIPTION : Improper drainage and waste disposal is one of the major causes for insanitary conditions in rural areas. This problem of rural women to dispose household waste water is solved by the Central Building Research Institute by developing this improved disposal system.

CONSTRUCTION : Through this system all domestic wastewater is led underground through a bore-hole, close to water outlet. An ash-silt trap chamber is provided, adjacent to the bore-hole, which collects most of the solid matter in water and prevents the borehole from getting clogged up.

The ash-silt trap chamber (see illustration) is 70 cms deep and has half-brick thick wall. It is partitioned off into two compartments by another half-brick wall and is covered by a concrete slab. The first compartment is slightly larger than the second and triangular ducts, 8.2 cm wide and 46 cm deep, are made in one corner adjacent to each other, in both compartments, diagonally opposite to the inlet. The partition wall has a passage below the top of the duct to provide an inter-connection between the two ducts. While the first compartment is left empty, the second compartment is filled with broken brick aggregate (4 cm thick).

WORKING : In the first compartment, all solids such as clay and ash contained in wastewater settles down and water containing only fibre particles, like grease etc., rises through the duct and enters bottom of the second compartment through its duct. The brick aggregate in this compartment serves to arrest finer particles and almost clear water percolates to charcoal for final disposal.

When the first compartment gets filled with ash, clay and other solid matter, water overflows and stops flowing into the second compartment. It is an indication that the first compartment needs cleaning, which can be easily managed manually. A borehole with 30 cm diameter and a depth of 3 metres is dug with a hand-auger and filled with brick aggregate. A depth of 3 metres is normally adequate for reaching a permeable sandy layer through which water can seep down to the underground watertable, But if no sandy stretch is met within this depth, the borehole may have to be dug slightly deeper or two bore holes made 30 cm apart and interconnected at the top, with the provision of a chamber over them.

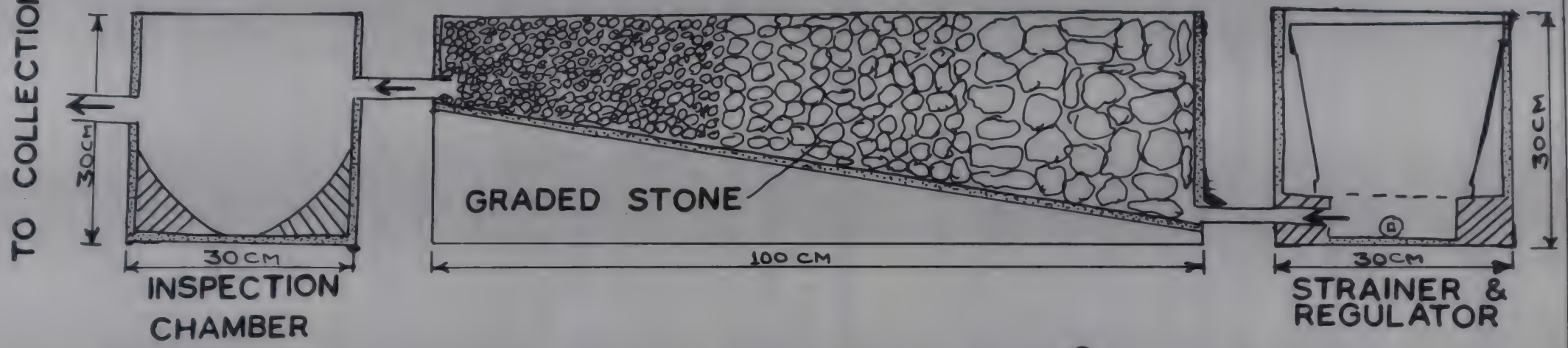
PRECAUTIONS : It is suggested that the system be constructed in the courtyard of the house, so that the house-owner is obliged to clean the first compartment when it gets choked and water starts overflowing into the courtyard.

ADVANTAGES : Unlike the normal soakage system, which gets choked frequently when the ash and clay flow directly into it, the proposed system is trouble-free since it provides for retention of the solids in a trap chamber which is subsequently cleaned when water starts overflowing. Another great benefit of this sytem lies in the fact that it recharges the water-table and helps in conserving water which would otherwise be lost due to evaporation. This is rather important for drought-prone areas.

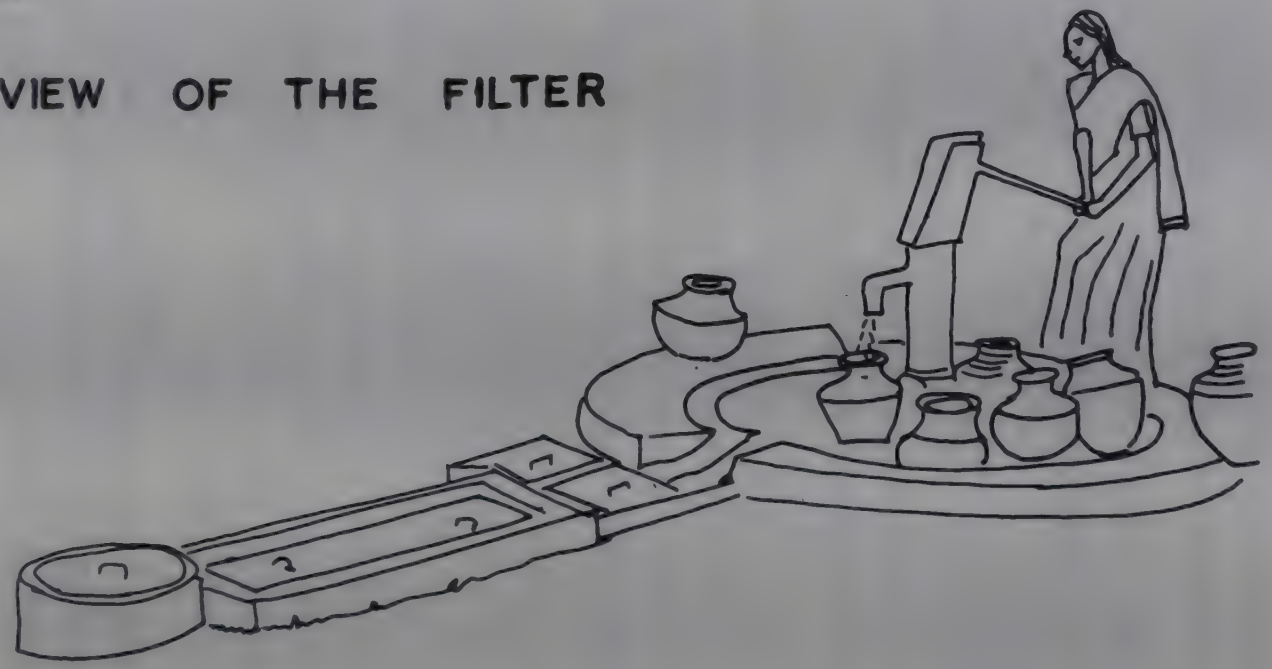
COST : Rs. 700/- (approx.)

SOURCE : DIRECTOR
CENTRAL BUILDING RESEARCH INSTITUTE
ROORKEE,UTTAR PRADESH

WASTE WATER RECYCLING UNIT



SECTIONAL VIEW OF THE FILTER



TECHNOLOGY NO. 100

WASTE WATER RECYCLING UNIT

DESCRIPTION : Wastage of water at a handpump is estimated at 2 litres per pitcher of 12-15 litres' capacity. A family collects, on an average, 10 pitchers of water daily. This means that at a source, serving about 50 families, about 1000 litres of water gets wasted daily. Eighty per cent of this water is procurable with this waste-water recycling technology.

MATERIALS : Weld mesh 25 mm x 25 mm (1″ x 1″) - 0.5 sq.m; Chicken mesh - 2 sq.m; Rods 6 mm -5 Kg; Cement - 1 bag (50 Kg.); Bricks - 100 Nos., Gate valve 38 mm (1½ - 1 No., PVC Pipe 38 mm 0.6 m; G.I. Sheet - 0.8 m^2; Mason - I — 3 days; Helper-I — 4 days; Sand - 25 Cubic Feet.

CONSTRUCTION : The recycling unit has an inlet with a strainer; a filter filled with graded stones; an inspection chamber; a collection tank and silt disposal pit.

Inlet : It is a small tank of 30 cm^3 with its outlet leading to the filtration tank. A regulator is provided at its side to facilitate easy cleaning of this unit. The chamber is provided with a movable metallic strainer.

Filter unit : It is a rectangular masonry tank of one metre length, 30 cm height. The bottom of the tank has a base, sloping upward from the inlet to the other end. The tank is filled with graded stones, bigger ones towards the inlet side and smaller ones at the farther end.

Inspection chamber : This is almost like a mini collection tank that fits into the system. It is used primarily to confrim periodically the quality of the recycled water. Also it facilitates free flow of water to the point of consumption.

Collection tank : It is designed according to the quantity of the water procurable from a source. This tank is located at the point of use. Underground pipeline carries the overflow from the inspection chamber to the collection tank. A prefabricated tank is suggested for the same.

Silt Disposal pit : It is a leach pit of 1 m diameter and 2 m depth provided with a concrete cover. This can be made as close as possible to the recycling unit. A pipeline connects this chamber with the disposal pit and the regulator controls release of the content.

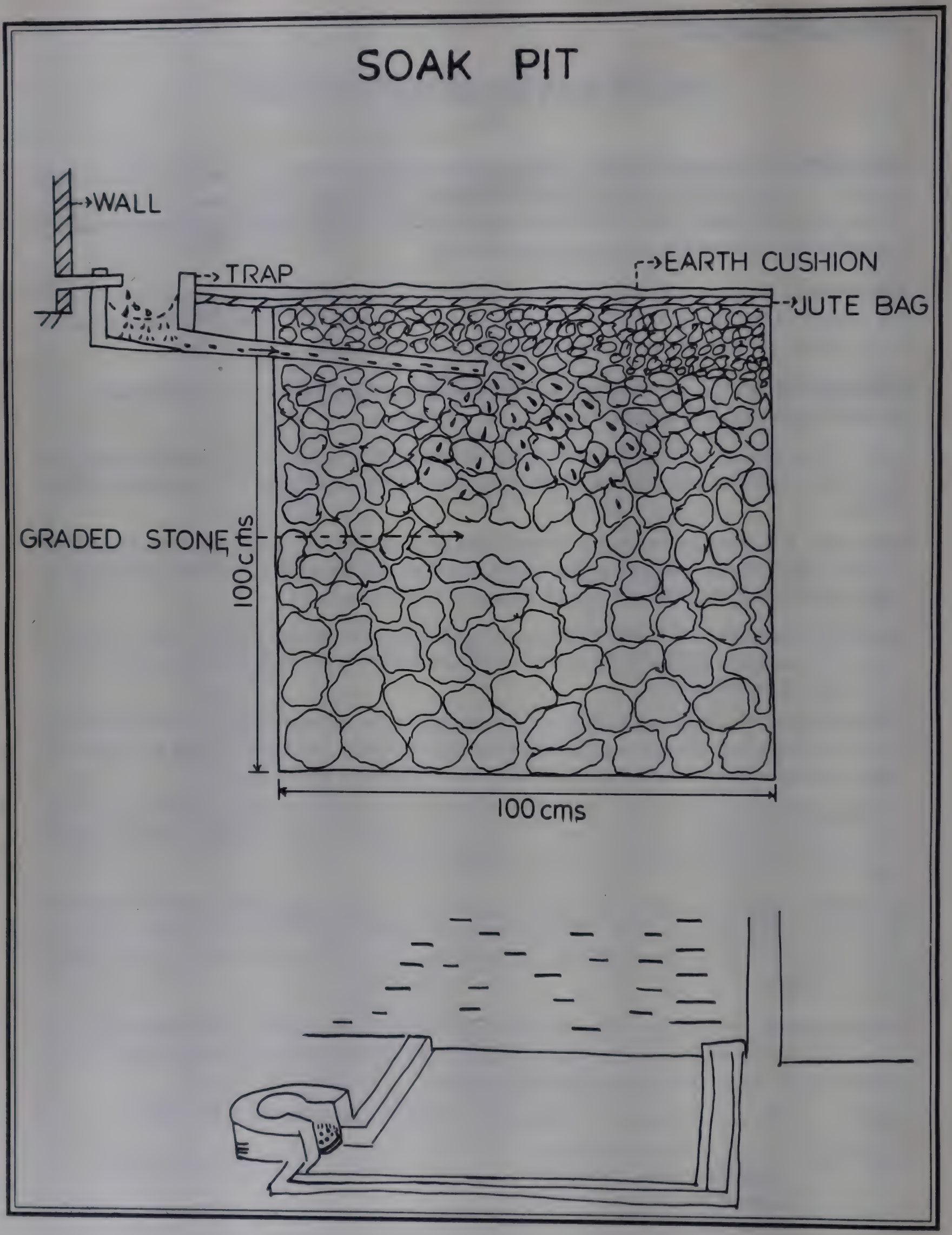
WORKING : The solid impurities like straw, coir or leaves present in the spill-over flow are trapped in the strainer. Water passes slowly through the filter column and, during its passage, the solid impurities are locked up between the stones. The water that comes out from the filter unit is fairly clear and usable.

PRECAUTIONS : The strainer in the inlet chamber should be cleaned daily. The outlet of the unit should be fixed at a level lower than that of the inlet. The location of the filter should be decided on the basis of the slope of the land and space-availability.

COST : The cost of the device excluding the collection tank is Rs. 750/- to Rs 900/-

SOURCE : DEPARTMENT OF HOME SCIENCE
GANDHIGRAM RURAL INSTITUTE
GANDHIGRAM - 624 302
TAMILNADU

SOAK PIT


WALL
TRAP
EARTH CUSHION
JUTE BAG
GRADED STONE
100 cms
100 cms

TECHNOLOGY NO. 101

SOAK-PIT

DESCRIPTION : Waste water from household operations like cooking, cleaning, laundering, bathing and the like is called sullage. One of the methods used for disposing sullage from individual houses is soak-pitting. Large sized impurities, present in the sullage, are held in the trap, and the rest that pass through the trap are destroyed by bacterial action inside the soak pit.

MATERIALS : Boulders and pebbles — 1 cart load; Perforated plate (15 cm dia) Plastic or metal — 1; P.V.C. Pipe (30 mm dia) 1 metre; Cement — 2 kgs; Bricks — 8 Nos; Polythene or Gunny bag — 4 Nos; Sand — 2 Cubic feet; Masonary charges —for 1 hour Manual labour (for digging, filling and finishing construction of the pit) — 1 day;

CONSTRUCTION : One square metre area close to the drain outlet and 30 - 60 cm away from the nearest wall of the house is used for making the soak pit. A one metre deep pit is dug.

Three grades of stones — big, medium and small are collected for filling the pit.

The pit is filled with big stones up to 30 cm followed by medium and small stones in a loose fashion to allow easy draining of water. The biggest stones are of the size of a coconut with husk and the smallest stone, the size of a big guava.

A trap made of perforated aluminium bowl for trapping solid waste is fixed near the exit drain. To prevent rain water from flowing into the soak-pit, and choking it, a 15 cm raised wall is made around the trap with broken bricks and mud/lime mortar. The trap is made just above the pit, and the drain outlet is connected with the pit by a pipe, as shown in the figure.

A small cavity is provided where the drained water falls into the soak pit. The pit is covered with gunny bags, preferably the synthetic ones (fertilizer bags), stretching 15 cm beyond each side of the pit.

On top of it, moist earth is spread uniformally up to 10 cm thickness and it is plastered with cow dung. The pit is completely concealed and the drain trap alone is visible above the ground level.

PRECAUTIONS : Periodically, the trap needs cleaning with a wooden spatula. One to 2 litres of water is poured to clear the trap and the passage. When the topsoil cover around the soak pit is found to be constantly moist, the pit is to be fully cleared and refilled with clean stones as it is an indication of soak pit becoming choked.

ADVANTAGES : The new design is compact and does not permit the solid impurities to pass through the trap. As a result, the life of the pit gets extended. The design permits construction of the soak pit at a distance from the drain outlet. Even in the middle of a street, a soak pit can be made. the weakenning of the walls of the building by moisture seepage from the soak pit could also be avoided by laying the pit away at a distance from the building.

COST : Rs. 100/-

SOURCE : DEPARTMENT OF HOME SCIENCE
GANDHIGRAM RURAL INSTITUTE,
GANDHIGRAM - 624302. TAMIL NADU

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